

ALBERTA  
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APR 03 1985

# GUIDE TO CROP PROTECTION IN ALBERTA

## PART I — CHEMICAL

**Herbicides**

**Insecticides**

**Fungicides**

**Alberta**  
AGRICULTURE

AGDEX 606-1

## **POISON CONTROL CENTRES**

UNIVERSITY OF ALBERTA  
83 Avenue - 112 Street  
Edmonton, Alberta  
Phone: 432-8432

ROYAL ALEXANDRA HOSPITAL  
10240 Kingsway  
Edmonton, Alberta  
Phone: 477-4444

CALGARY GENERAL HOSPITAL  
Calgary, Alberta  
Phone: 262-5982  
268-9625

FOOTHILLS HOSPITAL  
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Calgary, Alberta  
Phone: 270-1315

The Telephone Number of the Emergency Department of the Hospital in

Your Area is (403) \_\_\_\_\_

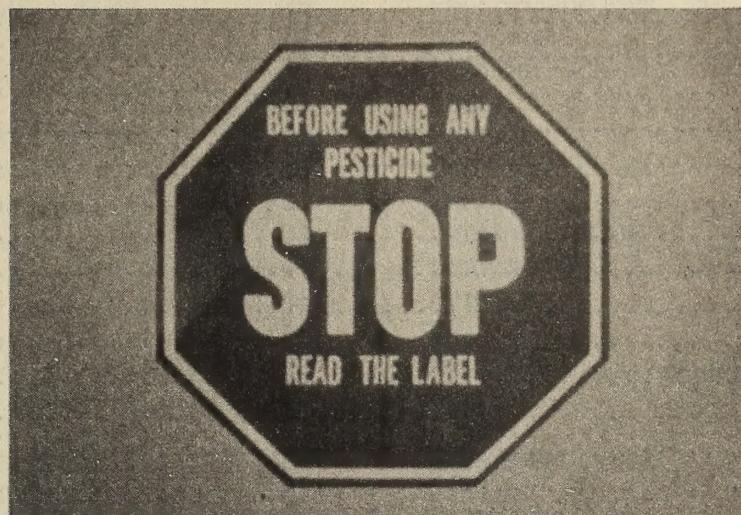
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# GUIDE TO CROP PROTECTION IN ALBERTA

## PART I — CHEMICAL

PREPARED BY ALBERTA AGRICULTURE



THIS PUBLICATION CONTAINS SELECTOR CHARTS AND DESCRIPTIVE TEXT WHICH MUST BE USED AS A UNIT.

NOTE: WHILE EVERY EFFORT HAS BEEN MADE TO ENSURE ACCURACY - CONSULT THE LABEL FOR FINAL DETAILED INSTRUCTIONS.

ALL RECOMMENDATIONS IN THIS PUBLICATION ARE GIVEN IN QUANTITY OF COMMERCIAL PRODUCT PER ACRE(ac) AND [PER HECTARE(ha)].

NOTE: LABEL RECOMMENDATIONS ARE GIVEN IN QUANTITY OF COMMERCIAL PRODUCT PER HECTARE ONLY.

### INSTRUCTIONS FOR USE:

1. IDENTIFY THE PEST(S).
2. REFER TO THE APPROPRIATE SELECTOR CHART FOR YOUR CROP.
3. NOTE THE PESTICIDES AVAILABLE FOR CONTROL FROM THE CHART.
4. LOOK UP EACH PESTICIDE AND NOTE CHARACTERISTICS, SAFETY PRECAUTIONS, METHOD OF APPLICATION, EFFECT ON PEST AND CROP, OTHER PESTS CONTROLLED, APPROXIMATE COST, ETC.
5. SELECT THE MATERIAL BEST SUITED TO YOUR NEED AND APPLY ACCORDING TO DIRECTIONS GIVEN.

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\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

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Insecticides and fungicides are described in the yellow section of this publication. Insecticide Index page 96. Fungicide Index page 121.

## **INSTRUCTIONS FOR USE OF GUIDE**

### **1. Tolerance of Crop to Herbicides.**

The number appearing in brackets following the crop on which each herbicide is registered represents the expected tolerance of the crop to that herbicide. Due to variations in variety, weather, timing and applicaiton techniques this number is only approximate. 0 = complete kill of the crop and 9 = no measurable injury to the crop.

### **2. Level of Weed Control with each Herbicide.**

The number appearing in brackets after each weed controlled by the herbicide represents the average level of weed control expected with the herbicide. Due to variation in weather, growth stage, time of day, application technique, etc. this number is only approximate. 0 = no control of the weed and 9.0 = complete kill of the weed.

### **3. Cost of Treatment**

The unit cost of each chemical, as supplied by the distributor in 1984, is listed. Calculate the cost of the proposed treatment by multiplying the proposed rate by the unit cost.

## **PROPER MIXING OF PESTICIDES**

1. Fill the sprayer half full with clean water.
2. Shake the closed herbicide container vigorously.
3. Slowly add herbicide to sprayer with agitator operating.
4. Allow container to drain into sprayer for 30 seconds.
5. Fill container one quarter full of rinse water.
6. Shake container vigorously, drain into sprayer for 30 seconds.
7. Repeat this procedure three times.
8. Fill sprayer tank with water, spray at once.
9. Always agitate vigorously if sprayer has been standing for a time after mixing.

# ADDRESSES AND TELEPHONE NUMBERS - CHEMICAL COMPANIES

Allied Chemical Services Ltd.  
5507 First Street S.E.  
Calgary, AB T2H 1H9  
(403) 253-8471

BASF Canada Inc.  
10 Constellation Court  
Rexdale, ON M9W 1K1  
(416) 675-3611

Chemagro Ltd.  
2381 Ness Avenue  
Winnipeg, MAN R3J 1A5  
(204) 885-1661

Chipman Inc.  
P.O. Box 965  
Winnipeg, MB R3C 2V5  
(204) 786-3421

Ciba Geigy Canada Ltd.  
820 - 26 Street N.E.  
Calgary, AB T2A 2M4  
(403) 273-5656

Cyanamid of Canada Ltd.  
712H 6 Street S.E.  
Calgary, AB T2H 2M8  
(403) 253-0924

Dow Chemical Canada Ltd.  
Ste. 2412, 10025 Jasper Ave.  
Edmonton, AB T5J 1S6  
(403) 428-0439

DuPont Canada Inc.  
#105, 333 - 25 Street E.  
Saskatoon, SK S7K 0L4  
(306) 244-4511

Elanco Products Division  
Eli Lilly Canada Inc.  
Unit #3, 9829 - 44 Ave.  
Edmonton, AB T6E 5E6  
(403) 436-7145

Hoechst Canada Inc.  
295 Henderson Drive  
Regina, SK S4N 6C2  
(306) 924-1500

Interprovincial Co-op Ltd.  
Box 1050  
Saskatoon, SK S7K 3M9  
(306) 244-3208

Later Chemicals Ltd.  
2239 - 14 A Street S.E.  
Calgary, AB T2G 3L1  
(403) 265-3501

May and Baker Canada Inc.  
1865 Sargent Avenue, Bay #2  
Winnipeg, MB R3H 0E4  
(204) 774-1819

Monsanto Canada Inc.  
55 Murray Park Rd.  
Winnipeg, MB R3J 3E2  
(204) 885-6740

MSD Ag Vet  
Division of Merck Frosst Canada Ltd.  
P.O. Box 1005, Pointe Clair  
Dorval, PQ H9R 4P8

Pfizer Chemicals and Genetics Inc.  
2140 Notre Dame Avenue  
Winnipeg, MB R3H 0K1  
(204) 632-5216

Phoenix Chemicals  
P.O. Box 1126  
Winnipeg, MB R3C 2Y4  
(204) 257-4000

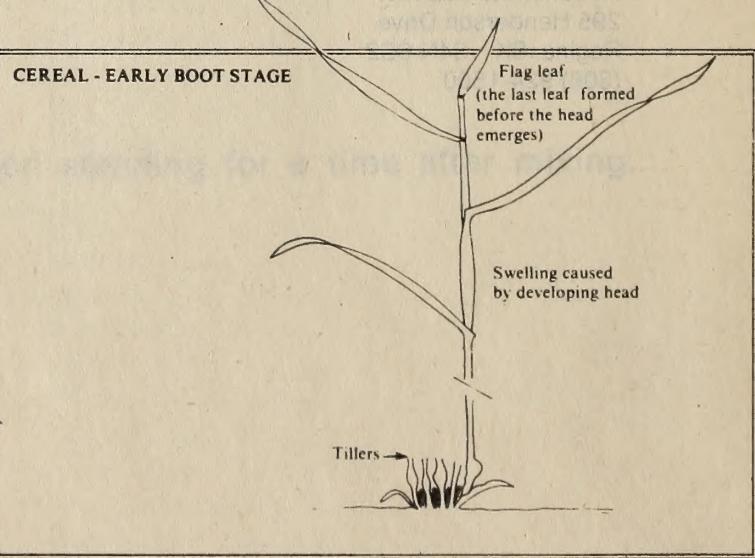
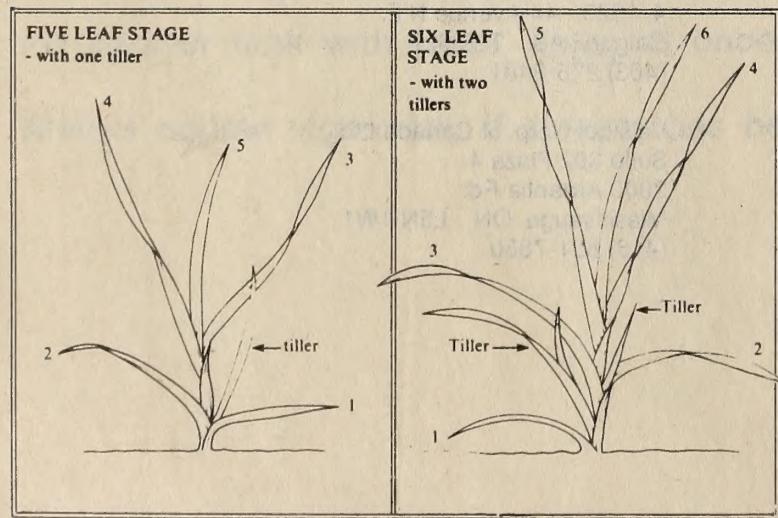
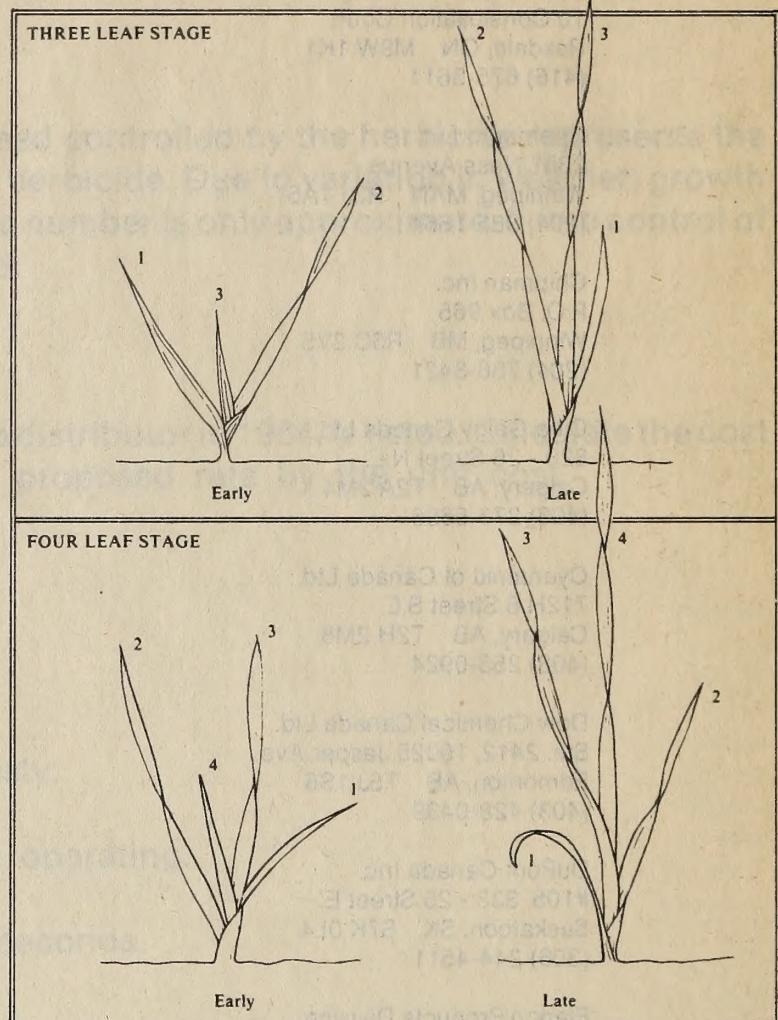
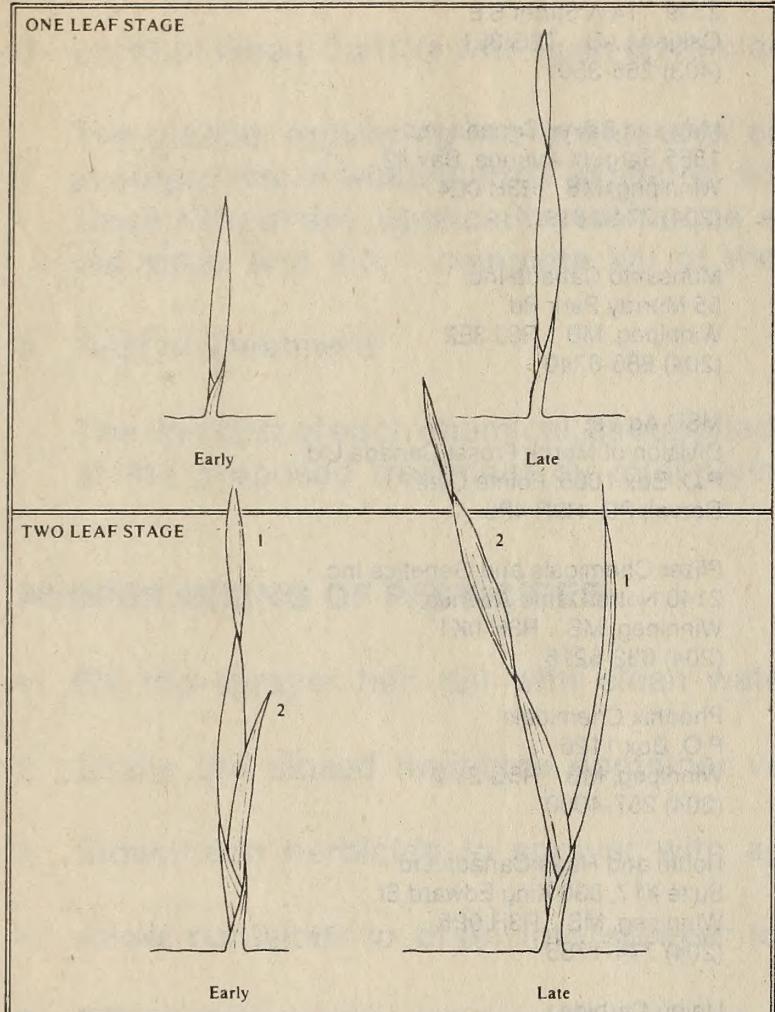
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Suite #17, 830 King Edward St.  
Winnipeg, MB R3H 0P5  
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472 Riverview Dr.  
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Mississauga, ON L5B 1M6  
(416) 848-4811

Uniroyal Chemicals  
4, 1323 - 44 Avenue N.E.  
Calgary, AB T2E 6L5  
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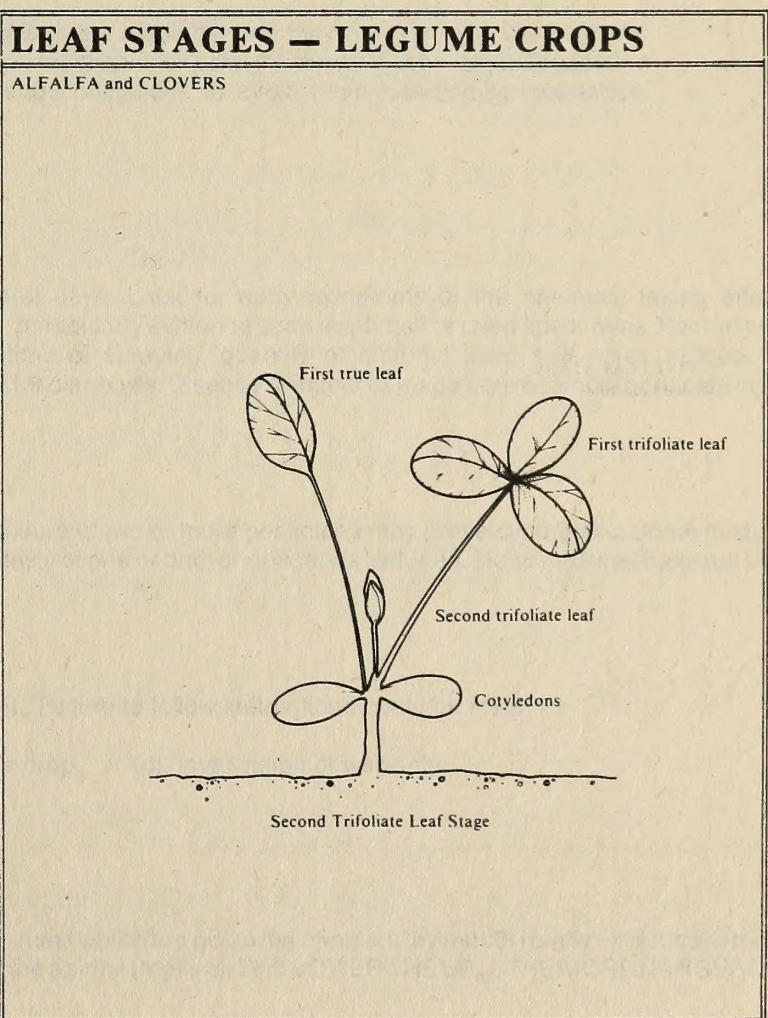
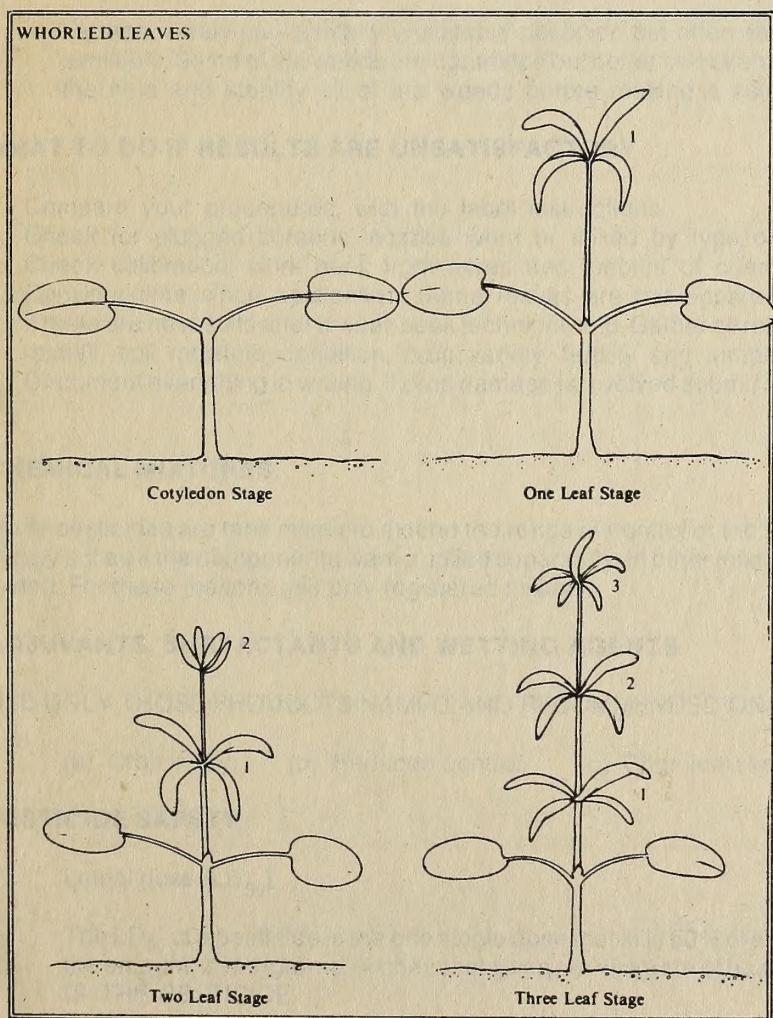
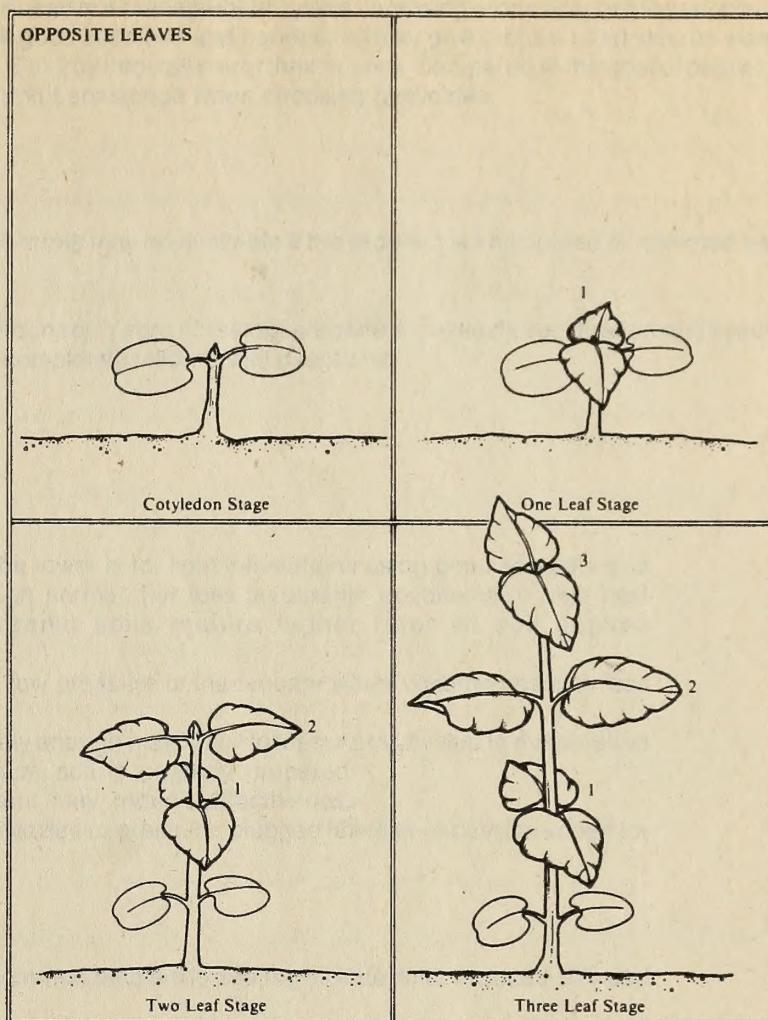
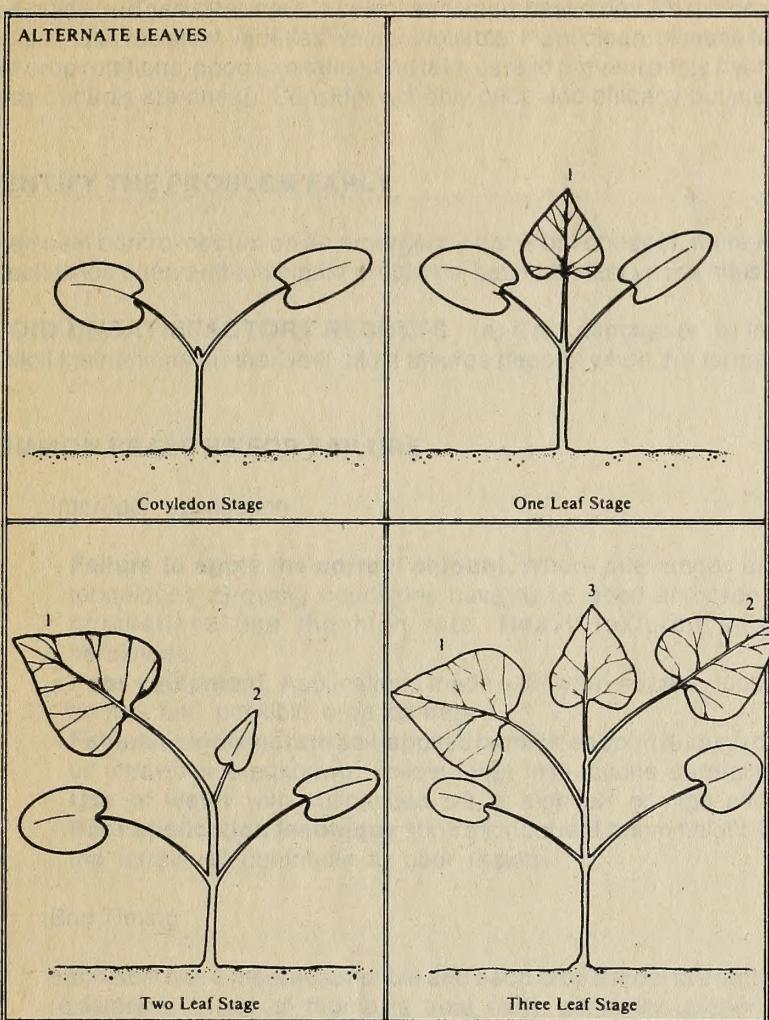
Velsicol Corp. of Canada Ltd.  
Suite 302 Plaza 4  
2000 Argentia Rd.  
Mississauga, ON L5N 1W1  
(416) 821-7850

# LEAF STAGES — CEREALS and GRASSES

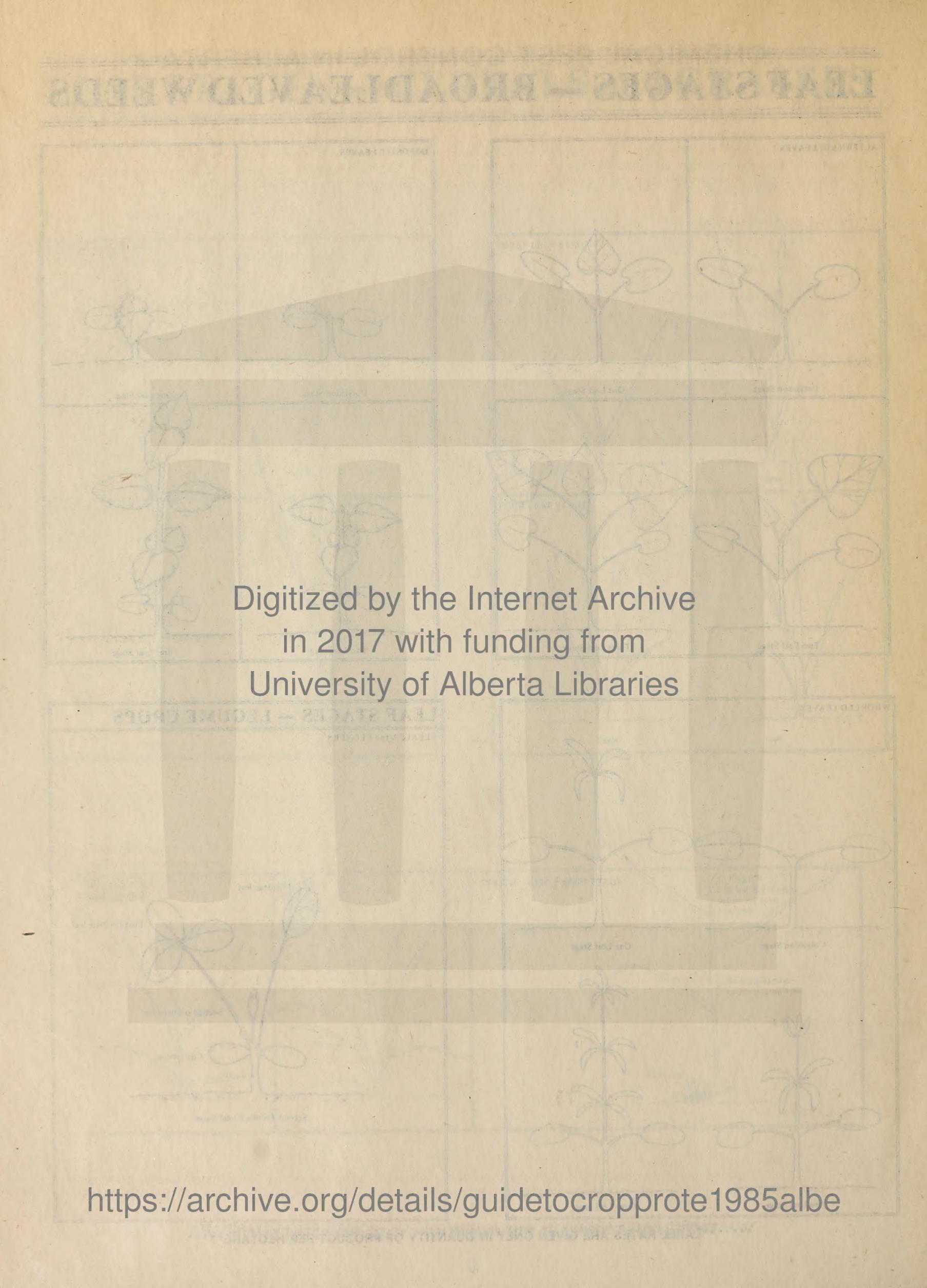


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# LEAF STAGES — BROADLEAVED WEEDS



\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*



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# CHEMICAL PEST CONTROL IN ALBERTA

## INTRODUCTION

This guide is to assist farmers to select and apply pesticides. Pesticides should be used in a management system including crops adapted to your climate and soil. Use resistant varieties where available. Plant clean, disease free seed. A good seed bed and banded fertilizer give crops a head start on weeds. Use crop rotations, good sanitation and take care to prevent pests overwintering. Destroy infestations at their source. Compared to the cost of pesticides these controls are cheap. Consider not only price and efficacy but also toxicity and persistence when choosing pesticides.

## IDENTIFY THE PROBLEM EARLY

Often pest control occurs on an emergency basis but cheaper, more effective controls may be available if the problem is anticipated or detected early. Check fields often and anticipate problems, based on last year's situation.

**AVOID UNSATISFACTORY RESULTS** - (a) Crop damage or (b) Inadequate control. Years of testing precede a pesticide registration and result in explicit instructions on the label. Most failures happen when the farmer doesn't completely follow these directions.

## COMMON REASONS FOR FAILURE

### 1. Improper application

- **Failure to apply the correct amount.** Where rate ranges are given, the lower is for light infestations using good sprayers and techniques. Growing conditions have to be good and crop competition normal. For less favourable conditions or high pest populations use the high rate. Heavy textured and high organic soils require higher rates of soil applied herbicides.
- **Poor equipment.** Applications made with worn nozzles, loose hitches, low pressure or inadequate water volumes result in less control and possible crop damage.
- **Failure to incorporate** soil-applied herbicides soon enough or thoroughly enough may result in loss of activity due to evaporation or ultraviolet breakdown. Follow label instructions carefully and ensure soil is properly prepared.
- **Use of water** with suspended silt, a high pH or high mineral content may reduce effectiveness.
- **Poor application technique** such as incorrect boom height, incorrect nozzles or pressure, plugged filters or excessive speed for the terrain all contribute to poor results.

### 2. Bad Timing

Each pest has a most susceptible and each crop a most tolerant stage. A common problem is treating too late, after the pests develop resistance. A rule of thumb is treat early within the proper stage.

### 3. Selection of the wrong material

Farmers rarely use a totally unsuitable pesticide but often several pesticides are available and they may not pick the best one available. Some of the weeds are controlled but better selection could control more species at no more cost. For best results examine the field and identify all of the weeds before making a selection. Change pesticides to avoid pests developing resistance.

## WHAT TO DO IF RESULTS ARE UNSATISFACTORY

1. Compare your procedures, with the label instructions.
2. Check for plugged screens, nozzles worn or mixed by type or size.
3. Check calibration, work back from acres and amount of chemical.
4. Consider time since application. Some results are not apparent for several days. Look for early symptoms of the chemical taking effect.
5. If there are no results after a week seek technical help. Gather all relevant data, particularly evidence such as photos or dried specimens. Record wind, rainfall, soil moisture condition, crop variety, fertility and temperature at time of spraying, quantity of material used and acres treated.
6. Document everything in writing. If crop damage is involved submit a specimen for diagnosis. Disease or insect damage can resemble herbicide injury.

## CHEMICAL MIXTURES

Many pesticides are tank mixed to extend the range of control or the timing. A mixture of two or more pesticides may prove synergistic. Some mixtures simply act as if the components were applied separately. In other mixtures the activity of one or both chemicals is reduced. Many mixtures have not been tested. For these reasons use only registered mixes.

## ADJUVANTS, SURFACTANTS AND WETTING AGENTS

USE ONLY THOSE PRODUCTS NAMED AND RECOMMENDED ON THE LABEL. Failure to follow instructions could be result in:

- (a) Crop injury.
- (b) Reduced control.
- (c) Chemical residue on the crop.
- (d) Invalidation of warranty.

## PESTICIDE SAFETY

### 1. Lethal dose ( $LD_{50}$ )

The  $LD_{50}$  of a pesticide is the one single dose that kills 50% of a group of animals which are given the chemical by mouth (orally). It is measured as the amount, in milligrams, of chemical given per kilogram of body weight of the animal (mg/kg). THE LOWER THE  $LD_{50}$ , THE MORE DANGEROUS IS THE PESTICIDE.

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The following table relates the LD<sub>50</sub> of a pesticide to its toxicity.

Oral LD <sub>50</sub> (mg/kg)	Toxicity	Oral LD <sub>50</sub> (mg/kg)	Toxicity
less than 50	extremely high	600 - 1,000	low
50 - 300	very high	greater than 1,000	very low
300 - 600	slightly high		

## 2. Human Exposure to Pesticides

Farmers may be exposed to pesticides when they are (a) handling and mixing powders, dusts and granules; (b) opening containers of emulsifiable concentrates (E.C.); (c) pouring concentrated liquids into the sprayer tank; and (d) spraying.

Pesticides may enter the body through the skin by mouth, and by inhalation. Penetration through skin is the most common way and occurs when the concentrated chemical is being handled, or the dilute material is being sprayed without proper safety clothing. Immediate illness may occur once enough chemical enters the body. Although many pesticides do not penetrate the skin, they may still cause problems such as redness, blisters, or dry scaliness that may lead to serious skin eczema and dermatitis. Pesticides may enter the body through cuts, scrapes and bruises which should be covered with band-aids or bandages. Eyes are very sensitive to pesticides. They can be exposed to vapour or fumes, spray drift, or accidental spills and splashes when containers of liquid concentrates are being opened or when the concentrated chemical is being poured into the sprayer tank. Pesticides can enter the mouth when a farmer eats or smokes with contaminated hands or when he licks his lips. Children may be poisoned if they drink pesticides stored in pop bottles. All pesticides should be stored in their original containers in a locked area out of reach of children. Never clear spray lines or nozzles with their mouth.

Pesticides can enter the body through inhalation of fumes, dusts, or spray mists. In the case of fumes and extremely fine particles of dust or spray, complete absorption of chemical by the lungs can occur and the hazard is high.

## 3. Standard Safety Precautions

Whenever working with pesticides, wear standard protective clothing: long sleeve shirt, full length pants, cap, coveralls and rubber boots.

In addition to the standard clothing, use common sense to decide what extra protection is needed for a particular job. Sometimes the label on the pesticide container gives details of extra precautions required. Extra protective equipment is rubber or neoprene gloves, goggles, respirators, and gas masks.

- (i) **Coveralls:** Two types of coveralls are available: reusable and disposable. Reusable cotton coveralls are washable and can be used again and again. Disposable paper coveralls are usually more comfortable in hot weather and are lightweight. If they become damaged or severely contaminated, they should be discarded. Wash coveralls after every pesticide application or when contaminated.
- (ii) **Rubber boots:** Do not wear leather boots and sneakers as they absorb pesticides and are difficult to clean. The legs from the coveralls should be outside the top of the boots to prevent spills and splashes from running into the boots. If the inside of the boot is contaminated, it should be washed out immediately.
- (iii) **Caps:** Prevent powders, dusts, or spray mists being deposited on the hair or scalp and absorbed into the body.
- (vi) **Gloves:** These are required when handling, mixing, or pouring concentrated pesticides. Rubber or neoprene are recommended. Do not wear leather or cloth gloves. These materials soak up the chemical and become a source of continuous contamination. Gloves with holes should not be worn. The sleeves of the coveralls should be worn outside the gloves to prevent spills and splashes from running into the gloves.
- (v) **Goggles:** Eyes should be protected with goggles, which are resistant to chemicals and have ventilation to prevent fogging.
- (vi) **Respirators:** PERMANENT RESPIRATORS have one or two cartridges screwed on to a facepiece. Each cartridge contains a prefilter which removes dust and a filter of activated charcoal which absorbs the chemical. The cartridges are unscrewed and discarded as soon as any odour of the pesticide is detected in the facepiece. Permanent respirators are cleaned after each day's use: unscrew the cartridges and wash the facepiece with soap and water. Rinse the facepiece in clean water, dry with a clean cloth, and screw on the cartridges. The clean respirator should be stored in a sealed plastic bag to prevent cartridges from absorbing air borne contaminants. DISPOSABLE RESPIRATORS have the prefilter and filter in one cartridge that is permanently attached to the facepiece. The entire respirator is discarded when any odour is detected in the facepiece. These respirators should be stored in a sealed plastic bag. Farmers should buy respirators and cartridges approved for use with pesticides. Gauze and dust masks are not respirators and are not recommended for pesticide dusts.
- (vii) **Gas Mask:** These are used when a farmer is likely to be exposed to **very high levels** of pesticides. The facepiece covers the eyes, nose and mouth. It is connected by a flexible hose to a charcoal canister worn on the belt. The lifespan of this canister is longer than that of the respirator cartridges. Manufacturer's directions are to be followed for cleaning and storing gas masks and canisters.

## 4. Safety Equipment Stores

Safety clothing and equipment are sold by Alberta Wheat Pool, Cargill Grain, U.F.A. Coop, Fleck Bros., Leavitt Safety, and Safety Supply.

## 5. Poison Information Centres

The emergency department of most hospitals can deal with pesticide poisoning. However, there are three hospitals within the province with additional information on pesticide poisoning.

University of Alberta Hospital  
83 Avenue & 112 Street  
Edmonton, Alberta  
General Information: 432-8822

Calgary General Hospital  
Poison Control Centre: 262-5982  
Emergency Department: 268-9625

Foothills Hospitals  
1403 - 29 Street N.W.  
Calgary Alberta  
EMERGENCY Department: 270-1315

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

Some manufacturers have emergency telephone numbers to call in case of pesticide poisoning.

Chipman Incorporated  
Tel: 1-416-528-6771  
1-416-643-4123

Monsanto Canada Inc.  
Tel: 1-314-694-1000

Cyanamid Canada Inc.  
Tel: 1-416-356-8310

## 6. Standard First Aid Measures

Before using a pesticide, look for the hazard symbol on the label. This indicates the toxicity of the pesticide. If you are severely exposed to a pesticide and you are alone, DON'T PANIC. The symptoms do not show up immediately. You will have some time to decontaminate yourself. Get any spilled pesticide off your body immediately. If the pesticide is on your clothes, remove them and rinse your skin with water. After rinsing, wash the area with soap and water. If you splash or spill pesticide in your eyes, wash eyes with water at once. Hold the eyelids open and wash for at least 15 minutes with fresh water. Get help to take you to the emergency department of the nearest hospital and take the labelled container with you. Do not use eye medication unless prescribed by a doctor.

Accidental swallowing — read the label under FIRST AID INSTRUCTIONS to determine whether or not to induce vomiting. Usually if the formulation contains PETROLEUM DISTILLATES, vomiting should not be induced. If the label recommends vomiting, do so at once either by putting a finger down the throat or by drinking 15 mL (2 tablespoons) syrup of ipecac. Get to a hospital as soon as possible. Never induce vomiting if a person is unconscious or is in convulsions. The person could choke to death on the vomit fluid.

## 7. Other Precautions and Safety Tips

- (i) Bees may be affected by pesticides or honey may be contaminated. Avoid spraying near hives or contaminating puddles of water from which bees may drink. Spray early in morning or late in afternoon when bee activity is at minimum. Warn beekeepers of your intentions so they can confine the bees or move them until spraying is over.
- (ii) Make sure herbicide containers are completely empty when you are finished. Rinse the container with water three times and add the wash water to sprayer tank. The container is virtually clean and may be disposed of at an approved pesticide container collection site. Consult your local district agriculturist if a collection site does not exist in your area. Never reuse the container for other purposes.
- (iii) Control systems using electrically operated solenoid valves are available. These allow sprayers to be controlled remotely, preferably from within a cab. Cabs provide some protection against spray drift and a good tight cab with filtered air intake should reduce but not eliminate operator exposure.

## AIRCRAFT APPLICATION

Aircraft applicators must take care to get even distribution pesticides and avoid damage to crops. The following suggestions are offered to help minimize these hazards.

- I. To get best coverage of crops and minimize the loss of spray to the atmosphere, spray in winds under 15 km/h. For best results apply herbicides in volumes not less than 14 L/ac (35 L/ha). Fly as low as is safe. Width of swath should not be more than 1.25 of wingspan. Space the nozzles on the boom to give uniform distribution in the swath in spite of swirl from propeller and vortexes at the wing tips.
- II. To Avoid Drift Damage from Aircraft application.  
Do not spray when wind is blowing toward a sensitive crop, shelterbelt or garden. Safe distances cannot be given. Do not spray in dead calm near sensitive plants. Do not apply volatile herbicides near a sensitive crop, shelterbelt or garden since the vapors rising from the field after application may be blown onto these plants.
- III. To Avoid Injury to Crops  
Use water as a carrier in preference to oil as injury is less likely. Apply at "safe" growth stage of the crop. Select the best chemical for the crop and weeds that are present and use only enough material for the degree of control desired.

## SOIL STERILANTS

Soil sterilants are growth preventers. They are poor killers of older weeds, they should be applied in the spring before growth begins or in the fall after growth ceases (before ground freezes). If application is made to established growth use a top kill material with the sterilant.

**Water volume** required for application of the soil sterilants is not critical, but even distribution over the ground surface is. Depending upon equipment used and foliage density this may vary between 100 and 1000 L/ac.

Soil sterilants are generally sold as wettable powders. Continuous gentle agitation is required to prevent settling out - heavy agitation will cause foaming and application problems. Make a slurry of the chemical in a separate container - fill the sprayer tank one half full of water - and while filling the tank with water and with the agitator operating pour the slurry into the tank. The agitator should not be stopped until the tank is empty. If by-pass agitation is used ensure the line enters the bottom of the tank to minimize foaming.

All screens and filters throughout the spraying system should be no finer than 50 mesh. Never use felt filters.

After using soil sterilants the equipment should be thoroughly washed, and rinse water disposal of on the treated site.

Most sterilants are relatively insoluble or become attached to soil particles - however heavy rainfall may cause physical movement of both chemical and soil particles and if the slope is steep movement will be substantial. Remember that after use of these products there will be no plant growth to slow erosion.

Bare ground will be maintained for 12 to 14 months after application. After this time chemical will have moved out of the top 2-3 cm of the soil surface and shallow rooted annual weeds and grasses will germinate. As they develop and send roots deeper into the chemical layer they will die, however there will always be new seeds germinating. By 24 months after application the "clean" layer of soil may be 6 to 8 cm deep and weed growth will be more obvious. At this time it may be necessary to apply a lower, reinforcing treatment of the soil sterilant.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

3. Each product will leave a group of plants which are slightly tolerant. If more than two successive applications are made results will appear quite unsuccessful as these tolerant plants will predominate. The solution is to rotate products.

## NITRATE POISONING DUE TO HERBICIDE ACTION

Nitrates are the major form in which plants take up nitrogen to be used by the plant for making protein and other nitrogen compounds that are important for plant life and growth. In normal circumstances nitrates are converted to these other products at about the same rate that they enter the plant. Under some conditions nitrates accumulate because they are entering the plant faster than they can be converted.

Nitrates combined with blood hemoglobin reducing oxygen utilization. The poisoned animal can die from suffocation. Nitrate accumulations may be due to leaf damage due to frost, hail or herbicide action. After severe frost, hail or herbicide damage the nutrient value of the crop will decrease rapidly. From a feed value point of view it is important to harvest as soon as practical - however in the case of herbicide treated crops there may be a waiting period specified on the label and in the case of **high risk crops**, such as oats or corn a delay may be adviseable to permit nitrate levels to decrease.

If there is a possibility of high nitrates in a feed, have it analysed at a feed testing laboratory. A veterinarian should be called immediately if livestock are showing unusual symptoms when they are being fed forages containing nitrates. Symptoms of nitrate poisoning include reduced milk production and growth rate, abortions and in severe cases death by suffocation.

## SPRAYER OPERATION

### BENCHMARKS

*Application Volume Is:*

100 litres per hectare (L/ha) = 40 litres per acre (L/ac)

*Spraying Pressure Is:*

275 kilopascals (kPa) = 40 pounds per sq. inch (psi)

*Speed For Spraying Is:*

9 kilometres per hour (kmh) = 5.6 miles per hour (mph)

*Nozzle Spacing On A Spray Boom Is:*

50 centimeters (cm) = 20 inches (in)

*Height Above Target for 80 Degree Nozzle Tips Is:*

45 centimeters (cm) = 18 inches (in)

*Nozzle Tips Are:*

TeeJet 8002 or Delavan LF 2-80

*Note:* Nozzle output must be 0.75 litres per minute at 275 kPa.

At 9 kmh the above nozzle tips will then apply 40 litres of spray per acre (100 L/ha).

### Metric Equivalents

1 hectare = 2.471 acres

6.9 kpa = 1 psi

1.6 kmh = 1m ph

2.54 cm = 1 in.

## SPRAYER CALIBRATION

Sprayer calibration consists of adjusting speed, pressure and nozzles to produce the desired spray volumes. Pick the spray volume desired, mix the chemical and water to the correct strength and operate the sprayer at the speed and pressure that will provide the correct application rate.

Spray volume, pressure and nozzle spacing are all standardized for each chemical and nozzle type.

All that remains for the operator to do is to select the nozzle tip that provides the desired spray volume at a convenient speed; or to pick the correct speed (if nozzles are already determined) and to mix the chemical accordingly.

This system of calibration requires that the sprayer is in good working order, that the nozzles are not worn out and that the gauge provides a true reading of pressure at the nozzle.

The spray pattern must be uniform along the entire boom. To achieve a uniform pattern there are several conditions that must occur simultaneously:

1. Pressure must be correct.	3. Output from all nozzles must be equal.
2. Spray patterns from each nozzle must not be streaky.	4. Distance of nozzle tip from target must be correct.

The following steps are suggested to ensure that the sprayer is in good working order so that correct calibration can be achieved.

1. Remove and clean nozzles, screens and filters.
2. Check that nozzles are all the same size and spray angle.
3. Flush the entire system and install filters, screens and nozzles.
4. Check boom pressure with a gauge and compare to sprayer gauge (they should be identical). If boom pressure is lower, check for a flow restriction.
5. With pressure set at 275 kPa, clean or replace streaking nozzles then collect spray from each nozzle and compare to manufacturers specifications. Replace nozzles that vary by more than 5% of specifications. (nozzle chart in this section)

*Note:* If ball check valves are being used an extra 35 kPa pressure is required to account for flow restriction. Diaphragm check valves do not require extra pressure.

Once it has been established that the sprayer is operating correctly the spray volume can be determined from the nozzle chart. The spray volume is controlled by varying forward speed. **Do not change pressure setting.**

Example: If a sprayer is equipped with nozzle tips other than the STANDARD tips and the nozzle chart does not indicate at which speed that nozzle will provide 40 L/ac (100 L/ha) it will then be necessary to establish that speed.

eg. (from chart)

Nozzle No. 80015 provides 46 L/ac (113 L/ha) at 275 kPa and 6 kmh. To find which speed will provide 40 L/ac (100 L/ha)

multiply: known L/ac x known speed, then divide by required L/ac

46 L/ac x 6 kmh = 276, then divide by 40 L/ac = 6.9 kmh.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

### SAMPLE NOZZLE CHART

Nozzle Type Teejet	Delavan	Pressure kPa	Output Per Minute Litres	Litres per Acre Litres per Hectare ( ) 50 cm Spacing			
				6 km/h	8 km/h	9 km/h	10 km/h
8001	LF 1-80	275	0.37	30 (75)	23 (56)	20 (50)	18 (45)
8001	5LF 1.5-80	275	0.56	46 (113)	34 (85)	31 (76)	28 (68)
8002*	LF 2-80	275	0.75	61 (151)	46 (113)	40 (100)	36 (90)
8001 L.P.		100	0.37	30 (74)	23 (56)	20 (50)	18 (45)
80015 L.P.		100	0.56	45 (112)	34 (84)	30 (75)	27 (67)
8002 L.P.*		100	0.74	59 (149)	45 (112)	40 (100)	36 (89)

\*STANDARD Tips for 40 L/ac (100 L/ha)

Following is an example of how a sprayer can be calibrated.

### SPRAYER CALIBRATION GUIDE

#### Litres Per Acre (L/ac)

##### PROCEDURE

- Step 1 - Field size
- Step 2 - Spray tank capacity
- Step 3 - Spray volume (standard is 40 L/ac)
- Step 4 - Select nozzle (from chart) that applies 40 L/ac
- Step 5 - Total spray volume (acres x L/ac)

##### EXAMPLE

50 Acres  
1800 Litres  
40 Litres per acre  
8002 = 40 L/ac at 275 kPa and 9 kmh  
50 ac x 40 L/ac = 2000 L

NOTE: SPRAY TANK HOLDS 1800 LITRES. AT 40 L/ac ONE FULL TANK COVERS 45 ACRES. A SECOND TANK WITH 200 L OF TOTAL SOLUTION IS NEEDED TO FINISH THE LAST 5 ACRES.

Step 6 - Amount of chemical to add:  
(rate per acre x no. of acres)

e.g. label states 0.6 L/ac

0.6 L/ac x 45 ac = 27 L in full tank  
0.6 L/ac x 5 ac = 3 L in second tank

Step 7 - Set pressure @ 275 kPa  
Drive at 9 kmh (ground speed chart)

### GROUND SPEED CHART

Speed kmh	Time to Travel 0.8 km (0.5 mile)	
	Minutes	Seconds
6.0	8	0
6.5	7	22
7.0	6	52
7.5	6	24
8.0	6	0
8.5	5	38
9.0	5	20
9.5	5	3
10.0	4	48

Note: Speed check should be done on a soil surface similar to

For nozzles or speeds not included refer to manufacturers data or *Guide To Weed Control In Alberta Part III - Herbicide Application Equipment*.

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If spray charts are not available for your nozzles the following formula may be used to establish their spray volume at a set pressure and speed.

$$\frac{60,000 \times \text{L/minute (one nozzle)}}{\text{km/h} \times \text{nozzle spacing (cm)}} = \text{L/ha}$$

To convert to L/ac divide L/ha by 2.471

First:

1. Adjust pressure to recommended setting (label).
2. Measure output of one nozzle (all nozzles must be equal).
3. Establish ground speed you will use.
4. Measure nozzle spacing (usually 50 cm).

Then use the above formula.

Example: 8002 nozzle @ 275 kPa has an output of 0.75 L/minute and will apply 100 L/ha @ 9 kmh.

$$\frac{60,000 \times .75 \text{ L/minute}}{9 \text{ kmh} \times 50 \text{ cm spacing}} = \frac{45,000}{450} = 100 \text{ L/ha or } 40 \text{ L/ac}$$

## GLOSSARY OF TERMS IN PEST CONTROL

<b>Active ingredient (a.i.)</b>	The concentration of chemical in a formulated product that is responsible for action.
<b>Adjuvant</b>	A substance added to a pesticide formulation or mix to improve the physical properties of that pesticide and hence its effectiveness. e.g. wetting agents, spreaders, stickers, and emulsifiers.
<b>Antagonism</b>	Opposing action of different chemicals such that the sum of their total effect is less than the effect if each pesticide were used alone.
<b>Antidote</b>	A first aid treatment to offset the toxic effect of a pesticide.
<b>Bioassay</b>	Determination of concentration of a herbicide by use of a sensitive indicator plant.
<b>Carrier</b>	A liquid or solid used to facilitate application of a pesticide.
<b>Chlorotic</b>	Loss or fading of green colour in foliage.
<b>Contact herbicide</b>	A herbicide that causes localized injury to plant tissue, only where contact occurs.
<b>Crop Canopy</b>	Covering or umbrella of crop plants over weeds and ground below.
<b>Degradation</b>	Breakdown of a pesticide by action of air, water, sunlight microbes or other agents.
<b>Desiccant</b>	A chemical used to accelerate drying of plant tissues.
<b>Foliar application</b>	Made to the leaves of plants, as opposed to soil application.
<b>Formulation</b>	Form in which the manufacturer prepares a pesticide to facilitate its use - granular, solution, emulsifiable concentrate, dry flowable, liquid flowable, wettable powder.
<b>Fumigant</b>	Vapour active chemical used against pests.
<b>Half-life</b>	Time required to breakdown 50% of a pesticide.
<b>Headland</b>	Field margin or roadway.
<b>Incompatibility</b>	Where one pesticide cannot be satisfactorily mixed with another - Mixture may gel, lose activity, settle out or be phytotoxic.
<b>Inhibit</b>	Prevent or stop a process e.g. inhibits photosynthesis.
<b>Metric Measurements</b>	mm = millimeter = .001 m; mL milliliter = .001 L : g = gram = .001 kg : kg = kilogram = 1000 g.
<b>Necrosis</b>	Localized death of plant tissue usually characterized by browning and desiccation.
<b>Photosynthesis</b>	Process by which green plants use sunlight, carbon dioxide and water to produce plant food.
<b>Phytotoxic</b>	Injurious to a plant.
<b>ppm</b>	Parts per million: ppb - Parts per billion.
<b>Residual herbicide</b>	Persists in soil and kills regrowth and/or germinating seedlings over an extended time.
<b>Soil sterilant</b>	A soil-applied herbicide intended to kill all plant life for an extended time.
<b>Spray drift</b>	Movement of airborne spray droplets beyond the target area.
<b>Synergism</b>	Complementary action of different pesticides such that the total effect is greater than the sum of their independent effect.
<b>Systemic pesticide</b>	One that is able to move in the plant from the initial point of contact.
<b>Translocation</b>	Process by which substances move within a plant.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

## AFOLAN F (linuron)

Hoechst

1. FORMULATIONS: Flowable - 450 g/L - 10 L containers.
2. REGISTERED MIXES: Afolan F + MCPA amine.
3. CROPS: Afolan F: Asparagus (8.7), carrots (8.2), corn (field and sweet) (6.5), celery (9.0), dill (6.8), parsnips (7.0), potatoes (8.7), shelterbelts (9.0). Afolan F + MCPA amine: spring wheat (8.2), barley (8.6), oats (8.9).
4. WEEDS CONTROLLED: **Afolan F** - barnyard grass (8.3), green foxtail (6.7), yellow foxtail (6.0), common chickweed (9.0), corn spurry (8.7), goosefoot (8.4), groundsel (8.6), knotweed, kochia (6.4), lamb's quarters (7.9), prostrate pigweed (8.7), redroot pigweed (7.9), purslane (8.4), common ragweed, shepherd's-purse (9.0), annual smartweeds (9.0), stinkweed (8.5), velvetleaf, wild buckwheat (8.5), wild radish, wormseed mustard (6.0) and seedlings of dandelion and perennial sow-thistle. **Afolan F + MCPA amine** - annual smartweeds (7.0), burdock, cocklebur, common chickweed (7.4), common ragweed, cow cockle (6.8), field horsetail (8.0), giant ragweed (9.0) goat's-beard, green foxtail (6.0), hemp-nettle (7.5), kochia (5.8), lamb's-quarters (8.9), mustard (wild, wormseed, ball, hare's-ear, indian, tumble) (8.8), prickly lettuce, prostrate pigweed (8.0), redroot pigweed (7.8), Russian pigweed, shepherd's-purse (8.3), stinkweed (8.9), stork's-bill (8.3), tartary buckwheat (7.9), wild buckwheat (7.5), wild radish.
5. WEEDS SUPPRESSED: None.
6. WHEN USED:

**Afolan F** - asparagus - pre-emergent, carrots - 2 or more leaves - before grassy weeds are taller than 5 cm and broad leaved weeds than 15 cm. Celery transplants - when new growth starts. Parsnips - 2 or more leaves. Dill - 2 or more leaves. Fruit trees - directed spray around trunk of trees established at least 10 years. Shelterbelts - apply before or immediately after weeds emerge, but before they are 15 cm tall. Apply no earlier than 10 days after transplanting. After buds open apply as a directed spray. Potatoes - just before crop emergence, before grassy weeds are 5 cm tall. Corn (field, sweet) - before corn emerges or as a directed spray on weeds after corn is at least 38 cm tall.

**Afolan F + MCPA amine** - spring wheat, barley, oats - when crop in 2-4 leaf stage and weeds in 1-4 leaf stage. Do not apply after tillering.

7. HOW TO APPLY:

**With:** Ground equipment.

Rate: Wheat, barley, oats - Afolan F - 200-250 mL/ac (500-625 mL/ha) + MCPA amine 500-450 mL/ac (1.1 L/ha) - lower rates under above average growing conditions and rainfall.

Asparagus - Afolan F - 1.5-2.0 L/ac (3.8-5.0 L/ha).

Carrots, parsnips, dill - Afolan F - 575 mL-2.0 L/ac (1.4-5.0 L/ha) - higher rate on larger established weeds.

Celery transplants, corn (field, sweet), potatoes - Afolan F - 1.1-2.0 L/ac (2.8-5.0 L/ha). Shelterbelts - Afolan F - 4.0 L/ac (10.0 L/ha).

Fruit trees - Afolan F - 4.0 L/ac (10.0 L/ha).

**Cost:** Afolan F - \$19/L. MCPA amine - \$1/L.

**Application method:** Afolan F + MCPA amine 500 - 40 L/ac (100 L/ha) water - 275 kPa - 9 km/h. Screens 50 mesh or larger - 80° flat fan nozzles -adequate agitation required. Afolan F - 80-120 L/ac (200-300 L/ha) except on shelterbelts and fruit trees - directed spray required.

8. SPRAYING TIPS: Early application will avoid crop injury. Barley may suffer growth suppression, maturity delay and yield reduction which may be offset by control of heavy weed growth. Use only MCPA amine in mix to avoid crop injury, do not use very hard water with MCPA amine, and ensure adequate agitation. Make only one Afolan F application per crop year. Do not apply to crops under drought or frost stress. To avoid settling, spray soon after mixing.
9. HOW IT WORKS: Afolan F - both systemic and contact, absorbed through roots and leaves. MCPA is a systemic herbicide absorbed by leaves.
10. EXPECTED RESULTS: First, browning of older leaf tips, then water soaked, wilted appearance, progressive yellowing, stem collapse, browning and death. MCPA promotes stem bending, twisting and leaf cupping. Incorrect timing of application, stress conditions, crusted soil or rain immediately after spraying will cause poor results.
11. EFFECTS OF RAINFALL: Afolan F - rainfall within 1 hour may decrease effect. Unusually heavy rains after a pre-emergent application may cause severe injury to corn, carrots, or parsnips. Afolan F + MCPA amine - rainfall within 4 hours will detract from results.
12. MOVEMENT IN SOIL: Higher rates of Afolan F and extreme moisture may cause some leaching.
13. GRAZING AND CROPPING RESTRICTIONS: Do not graze or feed green plants to livestock. Do not apply within 60 days harvest of corn. No restriction on succeeding crops.
14. TOXICITY: Oral LD<sub>50</sub> 1500 mg/kg - very low mammalian toxicity, very toxic to fish. May irritate eyes, skin, nose and throat.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) and goggles. Use standard first aid measures (see page 3) if skin or eyes are exposed. Induce vomiting if swallowed. Medical aid in all cases.
16. STORAGE: Do not store below 5°C. If stored for one year or longer, shake well before using.

### PRACTICAL USE CONSIDERATIONS

1. Pre-emerge applied Afolan F requires rainfall or irrigation to activate.
2. At rates of 2.0 L/ac (4.9 L/ha) or more, approximately 25% of the chemical will carry over into next season.
3. To reduce chances of crop injury, do not apply if crop is under heat stress.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**AMIBEN (chloramben)**  
Pfizer

1. FORMULATIONS: Solution - 240 g/L - 22.7 L containers. Granular - 10% - 22.7 kg bags.
2. REGISTERED MIXES: A tank mix of Amiben + Treflan for sunflowers.
3. CROPS: Asparagus (8.4), lima beans, pumpkins, red kidney beans, snap beans, squash, white (dry) beans (9.0). Amiben + Treflan - sunflowers (9.0)  
Underseeding: Not recommended.
4. WEEDS CONTROLLED: Barnyard grass (7.5), common chickweed (9.0), green foxtail (6.1), yellow foxtail (5.1), lamb's-quarters (6.7), pigweed (redroot, prostrate) (6.2), ragweed, smartweed (annual) (7.9), wild mustard (8.3), stinkweed (8.0).
5. WEEDS SUPPRESSED: None
6. WHEN USED: Pre-plant incorporated or post-plant pre-emergent.
7. HOW TO APPLY:

**With:** Ground equipment.

**Rate:** Asparagus, snap beans, squash, pumpkins - 3.8-5.6 L/ac (9.3-14 L/ha), lima beans - 5.6 L/ac (14 L/ha). White beans - 3.8 L/ac (9.3 L/ha). Red kidney beans - 5.6 L/ac (14 L/ha). Sunflowers - 3.7 L/ac (9.2 L/ha) Amiben plus 1.1 L/ac (2.7 L/ha) Treflan on medium to heavy soils or 800 mL/ac (2.0 L/ha) Treflan on light soils.

**Cost:** \$6/L

**Water Volume:** 40 L/ac (100 L/ha)

**Incorporation:** Not required for vegetable crops. Thoroughly incorporate within 8 hours into the soil in two directions at right angles to each other for sunflowers. Set implements to cut 8.0 to 10.0 cm deep.

**Pressure:** 275 kPa

**Ground Speed:** Operate disc implements at 6-10 km/h, cultivators 10-13 km/h.

**Nozzles:** No restrictions.

8. SPRAYING TIPS:

- (a) For proper incorporation follow Treflan label.
- (b) Seed sunflowers within one week of application.
- (c) A light cultivation with a vegetable crop will increase weed control when there is inadequate moisture to move the Amiben down but enough moisture to germinate the weeds.

9. HOW IT WORKS: Requires moisture for activation, it inhibits root development of seedling weeds for several weeks.

10. EXPECTED RESULTS: Wild Mustard and Stinkweed: Affected seedlings will not emerge from the ground. Control of cruciferous species will last for at least 6-8 weeks following treatment.

Conditions under which poor results may be expected:

1. Application and incorporation when soil surface is wet.
2. Inadequate soil incorporation or the use of improper incorporation equipment.
3. Insufficient moisture to carry the chemical into the soil.

11. EFFECTS OF RAINFALL: In light soils a heavy rainfall may wash Amiben below the root zone of germinating weed seeds.

12. MOVEMENT IN SOIL: Water soluble.

13. GRAZING AND CROPPING RESTRICTIONS: None.

14. TOXICITY: Very low acute mammalian toxicity - oral LD<sub>50</sub> - rats - 3500 mg/kg - maybe a skin irritant. Non toxic to fish and birds.

15. PRECAUTIONS, FIRST AID: Wear protective gear (see page 2). Use standard first aid measures (see page 3) to clean skin and eyes. If swallowed, induce vomiting - get medical attention.

16. STORAGE: Store in heated area. If freezing occurs store in a warm room at 10-27°C for several hours and agitate thoroughly before using to ensure all crystals are dissolved.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**AMITROL-T (amitrole)**  
**Allied Chemical Services**

1. FORMULATIONS: Solution - 200 g/L - 1 and 10 L containers.
2. REGISTERED MIXES: None.
3. CROPS: Spot treatment - pastures, shelterbelts, roadsides, fence rows, ditch banks. Non-selective vegetation control.
4. WEEDS CONTROLLED: Canada thistle (7.4), cattails, field horsetail (8.2), hoary cress, leafy spurge, quackgrass (5.3), sow-thistle (annual, perennial), toadflax, showy milkweed, and most annual weeds.
5. WEEDS SUPPRESSED: None.
6. WHEN USED: Canada thistle and sow-thistle (annual, perennial) - bud to bloom, hoary cress - rosette to bud, cattails - bud to seed, field horsetail - no restrictions, leafy spurge - seedlings to bloom, toadflax - rosette to pre-bud, quackgrass - 15 to 30 cm, showy milkweed - 5-30 cm. Crops -non-selective - spot treatment only.
7. HOW TO APPLY:  
**With:** Ground equipment, hand sprayer.  
**Rate:** Canada thistle, sow thistle, quackgrass, toadflax, showy milkweed, hoary cress - 9-14 L/ac (22-35 L/ha), leafy spurge, cattails - 18-22 L/ac (45-55 L/ha), poison ivy - 4.5 L/ac (11 L/ha).  
**Cost:** \$5/L  
**Water Volume:** 80-200 L/ac (200-500 L/ha)  
**Pressure:** 150-275 kPa  
**Ground Speed:** Spot treatment.
8. SPRAYING TIPS: Spray to point of run-off, complete coverage of weeds essential. Do not till or mow for 2-3 weeks.
9. HOW IT WORKS: Systemic herbicide which inhibits chlorophyll production. Moves through foliar and root system.
10. EXPECTED RESULTS: Whitening begins in 7-14 days and plants die. Some residual activity. Conditions under which poor results may be expected: poor coverage, inadequate rate, plants over mature or under drought stress, tillage too soon after application.
11. EFFECTS OF RAINFALL: Heavy rain within 10-12 hours reduces effectiveness.
12. MOVEMENT IN SOIL: At recommended rates - persists for 2-4 weeks in warm, moist soils, may be longer in cold, dry soils.
13. GRAZING AND CROPPING RESTRICTIONS: Do not graze treated area for 6 months. Most crops susceptible to drift.
14. TOXICITY: Oral LD<sub>50</sub> - rats - 24,600 mg/kg - may be irritating to skin and eyes; has potential to cause enlarged thyroid after prolonged exposure. Non toxic to fish and birds. Do not apply on foraging bees.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) to avoid exposure. Use standard first aid measures (see page 3) to clean skin and eyes. If swallowed, induce vomiting and get medical aid.
16. STORAGE: Do not freeze or store above 50°C - No shelf life limitation. If frozen, contents will crystallize - to resuspend warm to 20-27°C and agitate.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**AMIZINE (amitrole + simazine)**  
Allied Chemical Services

1. FORMULATIONS: Solution - Amitrol - 53 g/L + simazine 106 g/L - 20 L pack.
2. REGISTERED MIXES: None. Mix restrictions: See section on soil sterilants - page 4.
3. CROPS: Industrial sites and non-cropped areas only.
4. WEEDS CONTROLLED: All broad-leaved weeds and grasses.
5. WEEDS SUPPRESSED: Not applicable.
6. WHEN USED: Apply in spring or early summer - weeds small - dandelion, green foxtail, kochia, lamb's-quarters, annual smartweeds, plantain, purslane, wild oats, redroot pigweed, grasses 1 - 19 cm tall.
7. HOW TO APPLY:

**With:** High volume ground sprayer; hand sprayer.

**Rate:** Ground sprayer - 35 L/ac (85 L/ha); hand sprayer 800 mL/100 sq m.

**Cost:** \$6/L.

**Water Volume:** 200 L/ac (500 L/ha); hand sprayer 8-12 L/100 sq. m.

**Pressure:** 275 kPa

**Nozzles:** Flat fan 8002 or larger.
8. SPRAYING TIPS: Use no finer than 50 mesh size screens.
9. HOW IT WORKS: absorbed by roots and moves through plant. Affects chlorophyll - plant whitens and dies slowly. Simazine remains in soil giving control for one growing season.
10. EXPECTED RESULTS: Plants turn white in 7-14 days and are usually dead in 3 weeks. Area should remain weed free for one season.
11. EFFECTS OF RAINFALL: Rainfall will carry chemical into root zone and speed action.
12. MOVEMENT IN SOIL: adsorbed on soil particles and resists leaching by rainfall.
13. GRAZING AND CROPPING RESTRICTIONS: not applicable. Lilac, privet, honeysuckle, barberry are very susceptible to drift.
14. TOXICITY: Very low acute mammalian toxicity.

Amitrole: Oral LD<sub>50</sub> rats = 24,600 mg/kg  
Simazine: Oral LD<sub>50</sub> rats = 5,000 mg/kg  
Has potential to cause enlarged thyroid after prolonged exposure or may cause dermatitis. Non-toxic to fish and birds.  
May be toxic to bees. Do not apply when bees are foraging.
15. PRECAUTIONS AND FIRST AID: Wear standard protective clothing (see page 2) to avoid exposure. Use standard first aid measures (see page 3) to clean skin and eyes. If swallowed, induce vomiting, get medical aid.
16. STORAGE: Do not freeze to avoid crystallization. If frozen, warm, agitate until crystals redissolve.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**ASULOX F (asulam)**  
**May and Baker**

1. FORMULATION: Solution - 400 g/L - 20 L pack.
2. REGISTERED MIXES: Asulox F + Buctril M (Flax)  
Asulox F + Embutox E (seeding and established alfalfa grown for seed).  
Mix restrictions: Add the required amount of Buctril M and mix, then add Asulox F.
3. CROPS: Flax (8.3), seedling and established alfalfa, grown for seed (8.3). Underseeding: Flax underseeded to alfalfa.
4. WEEDS CONTROLLED: Wild oats (7.8).
5. WEEDS SUPPRESSED: Green foxtail (6.3), volunteer oats (6.7), barley (3.3), wheat (3.0), barnyard grass, bluebur, wild mustard (8.0), stinkweed (8.6), wild buckwheat (5.3), annual smartweeds (7.1).
6. WHEN USED: 2-4 leaf stage of wild oats when flax 2.5-15 cm tall. Alfalfa when beyond first trifoliate leaf stage.
7. HOW TO APPLY:

**With:** Ground equipment. Floaters not recommended.

**Rate:** 1.1 L/ac (2.8 L/ha)

**Cost:** \$10/L

**Water Volume:** 20-40 L/ac (50-100 L/ha)

**Pressure:** 275 kPa

**Ground Speed:** 9 km/h

**Nozzles:** Flat fan nozzles. Flooding tips are not recommended.
8. SPRAYING TIPS: (a) Do not spray unthrifty crops or flax under stress due to drought or excess moisture.  
(b) DO NOT spray in hot, humid weather conditions or when crop is wet with dew.
9. HOW IT WORKS: Absorbed by leaves and translocated, inhibits cell division in the growing points of the plant. Symptoms are severe yellowing of new leaves, stunting and finally death. Growing points are killed within one to two weeks and full effect occurs by the fourth week.
10. EXPECTED RESULTS:

Wild oats: Start to yellow about one week after application. Wild oat plants not at the recommended growth stage or those that emerge after spraying will be unaffected.

Crop: Temporary slight yellowing of the flax leaves may occur a few days after spraying. Crop recovery from wild oat competition may be slow if the weeds have been allowed to smother the flax. Stunting and delay in maturity may be noticed.

Poor results may be expected: with incorrect spray volume or ground speed; improper stage of wild oats; spraying when foliage is wet with dew; spraying when flax is under stress or in hot, humid weather.
11. EFFECTS OF RAINFALL: Rainfall within 8 hours may seriously affect activity.
12. MOVEMENT IN SOIL: Not applicable.
13. GRAZING AND CROPPING RESTRICTIONS: *Drift:* Danger from drift is low, but cereals may be slightly yellowed. *Grazing Restrictions:* Do not graze or feed crop.
14. TOXICITY: Low acute mammalian toxicity - oral LD<sub>50</sub> - rats - 5000 mg/kg. Non toxic to birds, fish and bees.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) to prevent contact with skin and eyes. Use standard first aid measures (see page 3) if accidental skin and eye exposures occur. If swallowed, induce vomiting. Get medical attention.
16. STORAGE: Heated storage. Crystals, formed if frozen. May be redissolved by storing in a warm room and agitating.

**PRACTICAL USE CONSIDERATIONS**

1. Crop competition aids weed control with Asulox F.
2. Flax grown on soils with low fertility levels are more likely to sustain Asulox injury.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**ATRAZINE**  
Ciba Geigy and Chipman Inc.

1. FORMULATIONS: Aatrex 80W - Ciba Geigy - 80% wettable powder - 2.5 kg bag.  
Aatrex 90W - Ciba Geigy - 90% wettable powder - 2 kg bag.  
Aatrex Nine-O - Ciba Geigy - 90% water dispersible granule - 4.5 kg bag.  
Aatrex Plus - Ciba Geigy - flowable - 400 g/L + 5% oil concentrate - 22.7 L pack.  
Atra-Mix - Chipman Inc. - flowable - 400 g/L + 25% oil concentrate - 22.7 L pack.  
Aatrex Liquid - Ciba Geigy - Liquid 500 g/L - 10 L pack.
2. REGISTERED MIXES: Aatrex Plus and Atra-Mix - none. Aatrex 80W, Aatrex 90W, Aatrex Nine-O, Aatrex Liquid - with Booster Oil (emulsified oil), nitrogen solutions or complete liquid fertilizers, Dual Ciba Geigy 960, Lasso, Bladex and Sutan +.
3. CROPS: All corn.
4. WEEDS CONTROLLED: Barnyard grass, lamb's-quarters, mustards, purslane, ragweed, redroot pigweed, smartweeds, volunteer clover, wild buckwheat. Wild oats, green and yellow foxtail are best controlled by a post-emergent treatment or a pre-plant incorporated treatment, tank mixed with Dual Ciba Geigy 960.
5. WEEDS SUPPRESSED: None.
6. WHEN USED: Aatrex Nine-O, Aatrex 90W, Aatrex 80W, Aatrex Liquid - pre-plant, pre-emergent, post emergent or band applied. Aatrex Plus, Atra Mix - mainly post-emergent but may be used pre-emergent, after planting corn.
7. HOW TO APPLY:

**With:** Ground equipment.

**Rate:** (a) Aatrex Liquid - 1.3-2.7 L/ac (3.3-6.7 L/ha). Aatrex Liquid 1.3-1.8 L/ac + 6.9 L/ac emulsified oil (3.3-4.5 L/ha + 17 L/ha) in 60-120 L/ac (150-300 L/ha) of water.  
(b) Aatrex 90W, Aatrex Nine-O - 0.8-1.5 kg/ac (2.0-3.7 kg/ha).  
(c) Aatrex 80W - 0.8-1.7 kg/ac (2.0-4.2 kg/ha).  
(d) Aatrex Plus, Atra-Mix - light, sandy soil - 1.7 L/ac (4.2 L/ha), loam or clay - 2.3 L/ac (5.6 L/ha), high organic soils - 3.4 L/ac (8.4 L/ha).

Quackgrass Control - Atra-Mix - Apply 2.3 L/ac (5.6 L/ha) to quackgrass foliage in fall or early spring. Cultivate one to three weeks later, plant corn. Repeat chemical treatment as early post-emergent.

**Cost:** Aatrex Nine-O - \$6/kg - Aatrex Liquid - \$4/L - Aatrex Plus - \$4/kg.

**Water Volume:** 140 L/ac (350 L/ha)

**Incorporation:** Only Aatrex Liquid, Aatrex 80W, Aatrex 90W and Aatrex Nine-O are applied pre-plant. Do not incorporate deeper than 2.5 cm.

**Pressure:** 200-300 kPa

**Ground Speed:** As required to deliver 140 L/ac (350 L/ha)

**Nozzles:** Adequate to deliver 140 L/ac (350 L/ha)
8. SPRAYING TIPS:

(a) Do not mix oil concentrates, surfactants or hormone type herbicides with any formulation of Atrazine plus Bladex or Lasso.  
(b) When preparing a tank mix - add Atrazine to the tank of water first, agitate, add Bladex or Lasso slowly and agitate thoroughly.  
(c) Continuous gentle agitation is needed, but avoid excessive agitation, especially with oil mixtures, or a grease-like mass may form.  
(d) Use 50 mesh or larger strainers and use only metal filters.  
(e) Bypass line should discharge to bottom of tank.  
(f) If mixes containing oil are used, use at once and clean tank and system with a strong detergent solution.
9. HOW IT WORKS: Inhibits photosynthesis.
10. EXPECTED RESULTS: Weeds slow to emerge or under drought conditions will be killed when moisture improves. Heavy rainfall on sandy soils may cause leaching, a decrease in efficacy and off target injury.
11. EFFECT OF RAINFALL: Rainfall will activate the chemical, carrying it into the root zone where kill will begin.
12. MOVEMENT IN SOIL: Heavy rainfall on sandy soils may cause leaching and soil movement.
13. CROPPING AND GRAZING RESTRICTIONS: Crop injury may occur if land treated with atrazine is planted to any crop, other than corn, in the year of treatment. Sugar beets are sensitive to atrazine and should not be planted on land treated with atrazine the previous year. When an extended period of dry weather occurs during the year of treatment there could be some injury to succeeding crops such as white beans, onions, peas, tomatoes and turnips. Injury is most likely to occur when the seedling crop is subjected to periods of stress such as hot, dry weather. Under conditions of heavy rainfall, soil containing atrazine may wash and cause injury to sensitive crops. To reduce atrazine residues: Thorough tillage, including ploughing should precede the planting of crops other than corn. Uneven application of atrazine or application in excess of recommended rates will not injure corn but may result in injury to other succeeding crops.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

14. TOXICITY: Very low acute mammalian toxicity - oral LD<sub>50</sub> rats - 3080 mg/kg. Low toxicity to fish and birds. May cause eye irritation.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2), plus goggles. If Aatrex Plus or Atra-Mix are swallowed, do not induce vomiting, get medical attention. If Aatrex Liquid, Aatrex 90W, Aatrex Nine-O or Aatrex 80W are swallowed, induce vomiting, get medical attention. Use standard first aid measures (see page 3) to clean skin and eyes.
16. STORAGE: The flowable formulations should be kept from freezing. If stored in unheated areas the product should be warmed and agitated thoroughly prior to using.

#### **PRACTICAL USE CONSIDERATIONS**

1. Sugar beets should not be planted for two years following the growing season in which atrazine is used.
2. The crops most tolerant to Atrazine, next to corn are sorghum and then flax, fababeans, and peas. The latter crops may be seeded in the season following Atrazine application, provided the rate used was not greater than 400 g/ac (1 kg/ha) of active atrazine.
3. Band treatments are desirable where cultivation is intended to alleviate hard soil conditions or to control troublesome perennial weeds.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**AVADEX BW (triazlate)**  
Monsanto

1. FORMULATIONS: Emulsifiable Concentrate: 400 g/L - 22.7 L Granular 10% - 22.7 kg bags
2. REGISTERED MIXES: Avadex BW + Treflan and/or liquid or granular fertilizers. Thorough mixing is essential.
3. CROPS: Spring, durum wheat (8.3), barley (8.9), flax (8.9), rapeseed (8.2), field peas (9.0), mustard (9.0). Underseeding: Alfalfa, clovers, and bird's-foot trefoil may be seeded into Avadex treated soil.
4. WEEDS CONTROLLED: Wild oats (7.6)
5. WEEDS SUPPRESSED: None
6. WHEN USED: Spring - Pre-plant incorporated on barley, rapeseed, flax, peas, mustard. Post-plant incorporated on spring and durum wheat.  
Fall - All crops listed.  
*NOTE:* Where soil drifting is a problem, only granules are recommended for fall applications.
7. HOW TO APPLY:

**With:** Aircraft (granules only) or ground equipment

<b>Rate:</b>	<b>Crop</b>	<b>Spring Applications</b>			
		<b>Liquid</b>	<b>(L/ha)</b>	<b>kg/ac</b>	<b>(kg/ha)</b>
	Spring or durum wheat	1.4	(3.5)	6	(15)
	Barley	1.7	(4.2)	6-7	(15-17.5)
	Flax, rapeseed, peas, mustard	1.7-2.2	(4.25-5.5)	7-9.1	(17.5-22.5)

	<b>Liquid*</b>	<b>Fall Applications</b>			
		<b>Liquid*</b>	<b>(L/ha)</b>	<b>kg/ac</b>	<b>(kg/ha)</b>
	Spring or durum wheat	1.1-1.7	(3.5-4.25)	6-7	(15-17.5)
	Barley	1.7	(4.2)	6-7	(15-17.5)
	Flax, rapeseed, peas, mustard	1.7-2.2	(4.25-5.5)	7-9.1	(17.5-22.5)

**Cost:** \$8/L

**Water Volume:** Liquid only - minimum of 40 L/ac (100 L/ha)

**Incorporation Time:** Incorporate liquid immediately following application, granules within 48 hours.

**implements:** Use a double disc or light cultivator plus harrows for pre-plant incorporation. Heavy duty harrows must be used for post-plant incorporation. The following are recommended: Allied model #X6121 - four bar spring tooth harrows. Allied models #40 or #60-parallel bar diamond tooth harrows. **Caution** - this operation can lead to severe soil erosion.

**Pressure:** Liquid only - 200 kPa.

**Nozzles:** All fan type nozzles delivering 40 L/ac (100 L/ha).

\* Not recommended where soil erosion is a problem.

**8. SPRAYING TIPS:**

- (a) Incorporation equipment should be operated at 9 km/h.
- (b) Operate double discs and cultivators at a depth of 7.5 cm.
- (c) Do not incorporate into wet soil.
- (d) Straw, lumps of soil, etc: dragged by harrows will cause uneven incorporation resulting in reduced wild oat control.
- (e) On stubble, incorporate with double disc or cultivator followed by harrowing at right angles.
- (f) On fallow, use two harrowings at right angles if the soil is loose and free of trash and lumps.
- (g) Incorporation of Avadex BW/urea combination is recommended as follows:  
*Spring* - all crops except wheat. Two passes with a light cultivator or vibra-shank at right angles to each other with a delay of 24 hours between passes.  
*Fall* - Fall applications should be followed immediately by a shallow discing or cultivation. In the spring prior to seeding, a shallow cultivation at right angles to the fall operation is recommended. **Note:** Fall application is not recommended where erosion may be a problem.
- (h) After seeding, any deep ridges left by drills must be levelled by harrowing.
- (i) Use lower rates on fields treated with Treflan the previous year.
  - There is generally enough Treflan carry-over to provide some wild oat control but later flushes of wild oat growth would be controlled by Avadex.
  - Avadex treatment necessitates deeper seeding, which under dry conditions may result in injury due to residual Treflan.
  - Wheat is less tolerant to Avadex than barley. Wheat must be seeded below the Avadex layer.
  - Heavy rain right after seeding may injure wheat seeded less than 5 cm deep.

9. **HOW IT WORKS:** Absorbed by wild oat shoots, usually resulting in death before emergence. Under dry conditions wild oats may emerge and reach the 3 or 4 leaf stage before dying.

10. **EXPECTED RESULTS:** Wild oats: Usually kills wild oats before they emerge. Scraping away the soil 1 to 2 weeks following treatment will expose white to yellow wild oats shoots 2.0-2.5 cm in length with pinched tips. Plants which have emerged and absorbed a lethal dose will display a protrusion of the growing shoots through the lower stem. Under dry conditions, a rainfall of 1.5 cm or more when wild oats are emerging, can cause postemergent die-back of a high percentage of wild oat plants.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**Crop:** Wheat seeded into the treatment zone under very dry soil conditions may be thinned and delayed when germinating and emerging just prior to a heavy rainfall. Wheat must be seeded at least 1.5 cm below the treated layer of soil (eg. 5 to 7.5 cm).

Conditions under which less than satisfactory results may be expected:

1. Incomplete incorporation due to wet, cloddy soil, or heavy trash.
2. Incorporation delayed, or very dry soil conditions.
3. Ridges left by seeding may disrupt the treated layer and allow escapes.
4. Equipment deficiencies such as very light harrows.
5. Erodible soil may drift or wash from the incorporation activity.

11. **EFFECTS OF RAINFALL:** Moisture is required for activation. Rainfall immediately following application and before incorporation may result in reduced wild oat control due to dilution.
12. **MOVEMENT IN SOIL:** Negligible
13. **GRAZING AND CROPPING RESTRICTIONS:** Drift: No effect on standing crops. Grazing Restrictions: None Crop Use After Hail: No restrictions. Succeeding Crops: Oats should not be seeded into soil treated with Avadex BW in the previous year.
14. **TOXICITY:** - Low acute mammalian toxicity: oral LD<sub>50</sub> rats = 1675 - 2165 mg/kg; may cause slight eye irritation, slightly toxic to fish, non toxic to birds.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing to avoid getting chemical on skin or in the eyes (see page 2). Use standard first aid measures to wash skin and eyes (see page 3). DO NOT induce vomiting, seek medical aid.
16. **STORAGE:** Store above 0°C. If frozen, warm and agitate to redissolve crystals.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**AVENGE 200C (difenoquat)**  
**Cyanamid**

1. FORMULATION: Solution - 200 g/L - 20 L pack
2. REGISTERED MIXES: Avenge 200C with Torch or Pardner, Buctril M, Brominal M, Bromox 450, Sabre, 2,4-D Ester (wheat and barley), Glean (not on canary seed), MCPA ester and with MCPA ester + Torch or Pardner.

Mix restrictions: With agitator running add broadleaf herbicide to  $\frac{1}{2}$  of the water, then add the rest of water and the Avenge 200 C.  
With the Glean mix - ensure Glean is thoroughly dissolved before adding Avenge 200C. Do not use this mix in the Brown Soil zones.

Mixing with other pesticides: Not recommended.

3. CROPS: Barley (8.9), durum wheat (8.0), wheat (Benito, Canuck, Chester, Columbus, Fielder, Glenlea, Leader, Macoun, Neepawa, Selkirk) (8.7), canary seed (8.7), fall rye (Cougar, Frontier, Kodiak, Puma, Rymin) (8.7), triticale (Carman, Walsh), winter wheat (Norstar, Sundance), alfalfa, sweet clover, bird's-foot trefoil, creeping red fescue, meadow fescue, brome grass, timothy, crested wheat grass, orchard grass, Russian wild rye, reed canary grass, Kentucky blue grass.
4. WEEDS CONTROLLED: Wild oats (7.5)
5. WEEDS SUPPRESSED: None
6. WHEN USED: 3-5 leaf stage of wild oats. To maximize yield increase treat at 3-4 leaf stage to minimize early wild oat competition. Do not apply to barley, wheat or canary seed after 6 leaf stage of crop. Do not use Avenge/Glean mix in the brown soil zone and use no surfactant with the mixture.
7. HOW TO APPLY:

**With:** Aircraft or ground equipment.

**Rate:** More than 200 wild oat plants/m<sup>2</sup> - 1.7 L/ac (42.5 L/ha) - Fewer than 200 wild oat plants/m<sup>2</sup> - 1.4 L/ac (3.5 L/ha).

**Cost:** \$9/L

For the registered mixes use the recommended rate of the Avenge 200-C and the label recommended rate of the other herbicide. Use up to 0.45 L/ac (1.2 L/ha) of MCPA ester or 2,4-D ester 500 and 1.4 or 1.7 L/ac (3.5 or 4.2 L/ha) of Avenge 200-C.

**Water Volume:** Aircraft: Minimum 8 L/ac (20 L/ha) Ground - 40 L/ac (100 L/ha) Spray Coupe - 40 L/ac (100 L/ha)

**Incorporation:** Not applicable

**Pressure:** 275 kPa

**Ground Speed:** 8 km/h

**Nozzles:** All standard and low pressure nozzles delivering recommended volume.

8. SPRAYING TIPS: (a) Nozzle should be tilted 45° forward for better spray penetration, (b) If foaming is a problem use a silicone-based anti-foam agent, (c) no restriction on following pesticide applications, (d) Do not spray if crop heavy with dew.
9. HOW IT WORKS: Avenge acts on the growing point located at or just above the soil surface and placing herbicide at or below this point is most efficient. It disrupts cell division and elongation causing growth to stop. Works best at high temperature and humidity.

**10. EXPECTED RESULTS:**

**Wild Oats:** Start to yellow within 3-5 days after application. Effect will be faster when temperature and humidity are high. Affected plants will turn brown or remain stunted and partially green throughout the season. Wild oats in the 1-2 leaf stage at spraying or those that emerge after spraying will be unaffected.

**Crop:** A slight yellowing of the crop may be visible 5-7 days after application and will remain visible for two weeks.

Conditions under which poor results may be expected: spraying before 3 leaf stage; too low a rate of Avenge for the wild oat population; inadequate coverage due to dense broad-leaved weed population.

11. EFFECTS OF RAINFALL: Rainfall within 6 hours will seriously decrease activity.
12. MOVEMENT IN SOIL: Not applicable.
13. GRAZING AND CROPPING RESTRICTIONS: *Drift:* Only oats can be seriously affected by drift. *Grazing Restrictions:* Do not graze or feed crop for 8 weeks after treatment. Treated underseeded forages should not be grazed or harvested for feed during the year of seeding. *Crop Use After Hail:* Do not use for 8 weeks after treatment.
14. TOXICITY: High acute toxicity to mammals - oral LD<sub>50</sub> rats = 270 mg/kg. Short term symptoms of poisoning such as headaches, tiredness and diarrhea may appear in man. No long term health problems noted. Not toxic to fish, birds or bees.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) and goggles to prevent contact with skin and eyes. Use standard first aid measures if skin and eyes exposed (see page 3). Induce vomiting if swallowed. Medical aid in all cases.
16. STORAGE: Store in heated area. Crystals form in temperatures below 0°C, but will redissolve if brought into warm area and agitated vigorously. No loss of activity as long as mixing is thorough.

**PRACTICAL USE CONSIDERATIONS**

1. Stunting, thinning and yield loss will occur if used on non-recommended wheat varieties.
2. A silicone-based anti-foaming, Amway Spray Adjuvant Defoamer is available from Amway.
3. Avenge can be harsh on canary seed.
4. Do not use on underseeded alsike or white ladino clover.
5. Do not apply the mix with Glean by aircraft.
6. Precisely follow all use instructions for Glean, crop rotations, soil pH, tank cleaning as detailed on label.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**BANVEL/BANVEL 10G (dicamba)**  
Velsicol

1. FORMULATIONS: Solution, 400 g/L, 10 L container. Granular 10% - 11.34 kg/pack Banvel.  
Banvel 10G for agricultural and industrial non-cropland use.
2. REGISTERED MIXES: Banvel + 2,4-D (amine or L.V. ester)
  - Banvel + 2,4-D amine + mecoprop (Kil-Mor)
  - Banvel + MCPA amine; Banvel + MCPA-K
  - Banvel + MCPA amine + mecoprop (Target)
  - Banvel + Sencor or Lexone (metribuzin); Banvel + Roundup
- Mixing with other pesticides: Not recommended.
3. CROPS: Spring, durum and winter wheat (8.2), oats (8.6), barley (8.2), spring rye, field corn, pastures and rangeland grasses, noncrop areas (summerfallow and stubble), red fescue seed crops, canary seed and established turf.
- Underseeding: Legume underseeding not recommended.
4. WEEDS CONTROLLED: Banvel alone will control buckwheat (Tartary (6.7) and wild (7.9)), corn spurry (6.0), cow cockle (7.0), green smartweed (6.5), lady's-thumb and cleavers (6.4). Registered Banvel tank mixes will control these weeds plus weeds controlled by the other herbicide in the mix. Brush species (10G only) — Alder, aspen, balsam, fir, birch, elm, pin cherry, poplar, spruce, willow and cherry.
5. WEEDS SUPPRESSED: Banvel will control top growth of Canada thistle, field bindweed and perennial sow-thistle at in-crop rates. At noncrop rates Banvel will eliminate these from summerfallow or fallow situations.
6. WHEN USED: Crop leaf stage.

CROP	BANVEL	BANVEL + 2,4-D Amine	BANVEL + MCPA Amine	BANVEL + MCPA-K	BANVEL + Metribuzin
Wheat (spring durum)	2-5	2-5	2-5	2-5	2-4 (spring wheat only)
Oats	2-5	--	2-5	2-5	--
Barley	2-5	2-5	2-5	2-5	2-3
Spring Rye	2-5	2-3	--	--	--
Wheat (winter)	15-25 cm	15-25 cm	15-25 cm	15-25 cm	
Canary Seed	3-5		3-5		

Treatment	Height of Corn	
	Banvel	Banvel + 2,4-D amine
Post-emergence overall spray	up to 30 cm	up to 15 cm
Directed post-emergence spray	30 - 75 cm	15 - 75 cm

*Pasture and Rangeland Grasses* - When weeds are actively growing or when brush species are under 2 m in height, Banvel alone or Banvel + 2,4-D Amine or L.V. ester. (Do not use on timothy grown for seed).

*Crop-Free Land* - On summerfallow - cultivate in the spring and apply when thistles are in the early bud stage and field bindweed is in the flowering stage. Cultivate three weeks after treatment. On stubble - Apply to regrowth after harvest and at least two weeks prior to killing frost.

*Red Fescue* - When new seedling stands are 5.0 cm tall. - In established stands up to the shot blade stage

*Established Turf* - Apply when weeds are actively growing. Brush species (10G only) - 20-28 kg/ac (50-70 kg/ha). Use higher rate on light soils or areas of higher rainfall. Perennial weeds 22 kg/ac (56 kg/ha).

**7. HOW TO APPLY:**

**With:** Ground equipment

**Rate:** See following table (Recommend Product Rates)

**Cost:** \$18/L

**Water Volume:** Wheat, oats, barley, spring rye, red fescue, canary seed, established turf - 45 L/ac (110 L/ha). Corn - 90-140 L/ac (220-350 L/ha). Pastures and Rangeland grasses, crop-free land - 45-90 L/ac (110-220 L/ha)

**Incorporation:** Not applicable

**Pressure:** 275 kPa

**Ground Speed:** 9 km/h

**Nozzles:** All standard nozzles delivering 45 L/ac (110 L/ha)

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

CROP	BANVEL - ALONE mL/ac (L/ha)	BANVEL + 2,4-D AMINE 500 mL/ac + mL/ac (mL/ha + mL/ha)	BANVEL + MCPA AMINE 500 mL/ac + mL/ac (mL/ha + mL/ha)	BANVEL + MCPA-K 400 mL/ac + mL/ac (mL/ha + mL/ha)	BANVEL + METRIBUZIN rate/ac (rate/ha)
Wheat (spring and durum)	110-140 (275-350)	110-140 + 340 (275-350 + 850)	110-140 + 340 (275-350 + 850)	110-140 + 340 (275-350 + 850)	110-140 mL + 110-170 mL Sencor or 110 g Lexone DF (275-350 mL + 275-425 mL Sencor or 275 g Lexone DF)
Oats	110-140 (275-350)	---	110-140 + 170 (275-350 + 425)	110-140 + 170 (275-350 + 425)	---
Barley	110 (275)	110 + 340 (275 + 850)	110 + 340 (275 + 850)	110 + 340 (275 + 850)	110-140 - 110-170 mL Sencor or 110-140 g Lexone DF (275-350 + 275-425 mL or Sencor or 275-345 g Lexone DF)
Spring Rye	110-140 (275-350)	110-140 + 340 (275-350 + 850)	---	---	---
Winter Wheat	110-140 275-350	110-140 + 340 (275-350 + 850)	110-140 + 340 (275-350 + 850)	110-140+0.34 (275-350+0.85)	
Canary Seed	140 (350)	---	140 + 340 350 + 850	---	
Corn	285 (700)	140 + 340 (350 + 850)	---	---	
Red Rescue	285 (700)	285 + recommended rate (70 + recommended rate)	---	---	
Established— Turf	610 (1500)	610 + 900 (1.5 + 2.2 L)	---	---	
Crop Free Land	1.2 L (3.0 L)	---	---	---	
Pasture & Rangeland Grass				Banvel + 2,4-D Ester 600	
Weed Control	300 mL - 2.2 L (750 mL - 5.5 l)	---	2.7 L + 2.0L	2.7 L + 1.8 L in 1000 L water	
Brush Control	2.7 L + 4 L in 1000 L water	---		2.5 L + 3.3 L in 1000 L water	

--- indicates not registered nor recommended.

#### 8. SPRAYING TIPS:

- (a) Flat fan nozzles are more efficient than flooding tips.
- (b) Do not spray if rain is expected within four hours of application.
- (c) Best application is when crop is under good growing conditions and air temperature 10-25°C.
- (d) Avoid application if risk of severe drop in night temperature is forecast.
- (e) Avoid application when crop is under stress from adverse environmental conditions.
- (f) Crop damage can occur if the chemical is applied at any time other than the recommended crop stage.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

9. HOW IT WORKS: Banvel is absorbed through the roots and leaves and translocated in the phloem and the xylem, disrupting the metabolism.

10. EXPECTED RESULTS:

Weeds: Results may take 10-14 days to appear. Proliferation of tissues causes: twisting, bending of main stem, leaf petioles, cupping of leaves, increase in root size, stimulation of fibrous root production.

Crops:

1. Under certain growing conditions shortening of straw can occur in treated crops without having adverse affect on crop yield.
2. If applied at other than recommended crop stage, head and stem deformities may occur.
3. Crops under stress from excess moisture, drought, disease, etc. may suffer a further setback from Banvel. The crop injury that occurs may be offset by the weed control obtained.

Poor results may be expected: If it rains within four hours of application, or when older weeds are sprayed or if less than the recommended water volume is used.

11. EFFECTS OF RAINFALL: Rainfall more than four hours after application will not reduce effectiveness.

12. MOVEMENT IN SOIL: Not applicable.

13. GRAZING AND CROPPING RESTRICTIONS:

*Drift:* Can harm ornamentals and other desirable trees or plants.

*Grazing Restrictions:* Clearance has not been obtained for grazing wheat, barley, oats or rye prior to maturity.

*Corn:* Do not graze cattle or harvest for silage until 7 days following treatment with Banvel alone or Banvel plus 2,4-D amine. Apply no later than 2 weeks prior to tassel emergence on corn.

*Succeeding Crops:* No restrictions unless Banvel has been applied at 1.2 L/ac (3.0 L/ha) on fallow. Then grow only cereals or field corn the following year. If this application is made after September 1 or if the soil is dry subsequent to application, crop injury may occur in the following spring.

*Canary Seed:* Canary seed should be used only as bird seed.

*Pastures and Rangeland Grasses: Grazing and Hay Making Restrictions for Dairy Cattle*

Rate Per Acre	Rate Per Hectare	Days Delay Between Treatment and Grazing or Cutting For Hay For Dairy Cattle
Up to 500 mL Banvel	Up to 1.5 L Banvel	0
600 mL-1.1 L Banvel	1.5-2.7 L Banvel	7
1.1-2.2 L Banvel	2.7-5.5 L Banvel	14
2.2-4.4 L Banvel	5.5-11.0 L Banvel	30

1. Do not feed sprayed crops to animals within 30 days of slaughter.
2. Animals may graze treated pastures 30 days after Banvel application without restrictions on slaughter.

14. TOXICITY: low acute mammalian toxicity oral LD<sub>50</sub> rats - 1,700-2,900 mg/kg (technical), may cause mild skin irritation and extreme eye irritation and swelling, non-toxic to fish and birds.

15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) to reduce exposure and use standard first aid measures (see page 3) to clean contaminated skin and eyes. If swallowed, induce vomiting; get medical attention.

16. STORAGE: Protect from freezing but if frozen, no activity is lost if completely resuspended.

### PRACTICAL USE CONSIDERATIONS

1. It is important not to apply too heavy a rate of Banvel on cereal crops, nor to overlap sprayer swaths or crop yield may be reduced.
2. Better suppression or control of cleavers may be obtained by spraying early before the cleavers reach the three whorl stage.
3. Fall applications at 1.2 L/ac (3 L/ha) or higher rates have enough carry-over to affect cereal crops, especially barley, the following year.
4. Mixtures with 2,4-D have been used on winter wheat, at spring wheat rates. Application should be made before jointing stage.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**BASAGRAN (bentazon)**  
**BASF**

1. FORMULATION: Solution - 480 g/L - 10 L pack.
2. REGISTERED MIXES: None
3. CROPS: Common beans (dry, snap) (8.1), fababeans (8.6), flax (8.7), field and sweet corn (8.8) field peas (8.2), canning peas (8.3)  
Underseeding: Not recommended.
4. WEEDS CONTROLLED: Black nightshade (6.0), field bindweed (3.0), buttercup, cocklebur, common chickweed (7.2), common groundsel (8.5), corn spurry (7.0), lamb's-quarters (5.7), wild mustard (7.0), purslane, common ragweed, annual smartweeds (7.0), redroot pigweed (6.8), Canada thistle (4.7), Russian thistle (7.9), shepherd's purse (7.3), stinkweed (7.8).
5. WEEDS SUPPRESSED: None.
6. WHEN USED: The best time of application is 18 to 28 days after planting. Soybeans, most dry and snap common beans, and corn are tolerant at all growth stages.  
Peas can be treated with Basagran only after three pairs of leaves (or three nodes) are present. Fababeans may be treated with Basagran when the crop has 2-4 leaves, or is at least 10 cm tall. Flax may be treated with Basagran when it is 5 cm or taller.
7. HOW TO APPLY:  
**With:** Ground or air.  
**Rate:** All crops 700-900 mL/ac (1.8-2.2 L/ha). Add Assist oil concentrate to increase performance. Cittowett Plus at 2.5 L/1000 L of spray volume may be used instead. Do not use Assist on peas or Cittowett on flax or fababeans.  
**Cost:** \$26/L  
**Water Volume:** 80-160 L/ac (200-400 L/ha) - ground. 20-40 L/ac (50-100 L/ha) - air.  
**Pressure:** 275-400 kPa  
**Nozzles:** Flat fan type - not flood jet type.
8. SPRAYING TIPS: Best results when weeds young and actively growing and temperature above 20°C.
9. HOW IT WORKS: Contact herbicide which interferes with photosynthesis. In resistant plants, metabolized to a non toxic material.
10. EXPECTED RESULTS: Weeds: Weeds turn yellow initially and then brown, usually within two weeks.  
Crops: Yellowing, bronzing, speckling, or burning of leaves occurs sometimes. The crop usually outgrows the condition within 10 days.  
Poor results may be expected: when weeds are beyond recommended growth stage; when spray coverage is poor or under poor growing conditions.
11. EFFECTS OF RAINFALL: Rainfall within 6-8 hours of application may reduce activity.
12. MOVEMENT IN SOIL: Not applicable.
13. GRAZING AND CROPPING RESTRICTIONS: *Drift:* Avoid drift on to susceptible crops such as rapeseed and mustard. *Grazing Restrictions:* Do not feed green plants to livestock. *Succeeding Crops:* No restrictions.
14. TOXICITY: Low acute toxicity to mammals; oral LD<sub>50</sub> rats = 850 mg/kg (technical). Slightly toxic to fish; non-toxic to birds and bees.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). Use standard first aid measures (see page 4) to clean skin and eyes. If swallowed, do not induce vomiting. See a doctor immediately.
16. STORAGE: Basagran should be stored in a heated place. However, freezing will not affect activity. If frozen, warm to room temperature and shake well.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**BASFAPON (dalapon)**  
BASF

**CO-OP DALAPON**  
Interprovincial Co-op

1. FORMULATIONS: Soluble powder - 74%.  
25 kg pack

2. REGISTERED MIXES: Basfapon with 2,4-D, 2,4-DB,  
MCPA, MCPB.

Mixing Directions - Fill spray tank half full of water. Add either formulation of dalapon, agitate and add other herbicide while filling with water.

3. CROPS: Fallowland, flax (8.3) rapeseed (7.5),  
potatoes, asparagus, raspberries, peas, buckwheat.  
Underseeding: not recommended.

Fallowland, flax (8.3), alfalfa, bird's-foot trefoil (seed crops and new spring seedlings), field peas (6.3), processing peas (9.0).

Any combination of above crops.

4. WEEDS CONTROLLED: Annual grasses, barnyard grass (3.0), green foxtail seedlings (6.7), quackgrass.

5. WEEDS SUPPRESSED: None.

6. WHEN USED:

**Pre Plant or Summerfallow**

1. Spring - grass 10-15 cm tall - Fall - grass actively growing.
2. Potatoes - spring - grass 10-15 cm tall or after emergence of grass and before potatoes emerge.
3. Asparagus - after cutting.
4. Raspberries - Fall only.
5. Peas - 10-15 cm high and 25 days before preharvest.
6. Flax - 10-15 cm high and grasses 1-3 leaf stage.
7. Rapeseed - 2-4 leaf stage and grasses 1-3 leaf stage.
8. Buckwheat - 1-3 leaf stage

**Pre Plant Treatments**

1. Pasture renovation - late fall application, follow with a cultivation and seed the following spring. Summer application - cultivate 4-10 days after treatment, wait 2 weeks before seeding legumes.
2. Fall treatment for quackgrass on land to be planted to alfalfa the following spring. Till 4-10 days after treatment.
3. Spring treatment - fallow land, apply to actively growing quack grass - plow or cultivate 4-10 days later. Retreat any regrowth.

**Grass Control in Crops**

1. Flax and Rapeseed - Crops in seedling to 15 cm tall and grasses 1-3 leaf stage.
2. Alfalfa, Bird's-foot trefoil (seed only) fall when regrowth after cutting is 15 cm tall. Spring - before active growth begins. New spring seedlings - 4 weeks after seeding when legumes are 3-4 leaf stage, grass seedlings are small.
3. Peas - when 10-18 cm tall, at least 25 days before harvest and grass seedlings are small.

7. HOW TO APPLY:

**With:** Ground equipment.

**Rate:** Fallow or Preplant - 11-13 kg/ac (27.5-32.5 kg/ha)  
Potatoes (Quackgrass) - 7-9 kg/ac (17.3-22.5 kg/ha)  
Asparagus - 1.3-2.7 kg/ac (3.3-6.8 kg/ha)  
Peas, Flax, Rapeseed - 450 g - 700 g/ac (1.1-1.8 kg/ha)  
Buckwheat - 220-350 g/ac (1.1-1.8 kg/ha) in 40-60 L/ac (100-150 L/ha) of water.  
Raspberries - 1.3 kg/ac (3.2 kg/ha).  
Pasture - 2.2 kg/ac (5.5 kg/ha).

Aerial (preplant and fallowland), ground equipment otherwise.

**Pre Plant Treatments**

1. Pasture renovation - 2.2 kg/ac (5.5 kg/ha)
2. Fall Quackgrass treatment 6.8 kg/ac (16.5 kg/ha)
3. Spring Quackgrass treatment - Land to be cropped same year - 3.6 kg/ac (9 kg/ha).
4. Fallow land. 4.5 kg/ac (11 kg/ha)

**Grass Control in Crops**

1. Flax and Rapeseed - 350-450 g/ac (0.9-1.1 kg/ha)
2. Bird's-foot trefoil - seed crop only - established 1.3 kg/ac (3.2 kg/ha)
3. Alfalfa - seed crop only - established - 2.2 kg/ac (5.5 kg/ha).
4. New spring seedlings - alfalfa and bird's-foot trefoil 900 g - 1.3 kg/ac (2.2-3.2 kg/ha)
5. Peas - 450 g/ac (1.1 kg/ha)

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**Cost:** \$6/kg

**Water volume:** Not less than 40 L/ac (100 L/ha)

**Incorporation:** Not applicable

**Pressure:** 275 kPa

**Ground speed:** 9 kmh

**Nozzles:** All nozzles delivering 40 L/ac (100 L/ha) or more.

8. **SPRAYING TIPS:** In tank mixes with broad-leaf herbicides do not use more than 3.6 kg/ac (9 kg/ha) of Dalapon. Do not apply in the same summer and fall. Spray thoroughly and uniformly.
9. **HOW IT WORKS:** Absorbed by both roots and leaves and is easily washed off foliage. Translocates readily throughout the plant and accumulates in young tissue. It affects cell membrane permeability.
10. **EXPECTED RESULTS:** Several weeks may be required for maximum effect on top growth in heavy stands. Because of limited persistence in the soil, new seedling grasses may invade treated area. Re-treat or cultivate. If grass is not growing well, i.e. overly mature or suffering from drought or cold weather, results may be poor.
11. **EFFECTS OF RAINFALL:** Under dry conditions decomposition may be slower, and more time will be required after ploughing before certain crops can be planted. Rain shortly after application can wash the herbicide off the leaves.
12. **MOVEMENT IN SOIL:** Not a problem under normal use conditions.
13. **GRAZING AND CROPPING RESTRICTIONS:** Do not allow dairy or meat animals to graze on treated vegetation during the year of application. Do not graze or feed cuttings of bird's-foot trefoil and alfalfa, the year of treatment, to dairy animals or animals being finished for slaughter. Do not feed treated pea vines, pea silage or pea vine hay to livestock. On land to be planted to sensitive crops, including grasses, delay planting for at least 30 days after ploughing or deep cultivation, following application.
14. **TOXICITY:** Very low acute mammalian toxicity - Oral LD<sub>50</sub> - rats - 9300 mg/kg - non toxic to fish and birds. Moderate skin, nose and throat irritant on repeated, prolonged contact.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page 2) and avoid prolonged exposure. Use standard first aid measures (see page 3) to clean skin and eyes.
16. **STORAGE:** Store away from food and feed stuffs.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**BENAZOLIN (benazolin)**  
Ciba Geigy

1. FORMULATIONS: Solution 350 g/L - 4 L containers.
2. REGISTERED MIXES: None.
3. CROPS: Rapeseed (7.9). Underseeding: Not recommended.
4. WEEDS CONTROLLED: Wild mustard (7.8)
5. WEEDS SUPPRESSED: Canada thistle (3.7)
6. WHEN USED: Rapeseed: 2-3 leaf stage; mustard: 2-4 leaves.
7. HOW TO APPLY:

**With:** No equipment restrictions specified

**Rate:** 600-850 mL/ac (1.5-2.1 L/ha)

**Cost:** \$48/L

**Water Volume:** 20-40 L/ac (50-100 L/ha)

**Pressure:** 275 kPa

**Ground Speed:** No restrictions specified

**Nozzles:** Those capable of providing 20-40 L/ac (50-100 L/ha).

8. SPRAYING TIPS: Remove all traces of herbicides from sprayer before spraying rapeseed - this is **absolutely essential**.
9. HOW IT WORKS: Not known.
10. EXPECTED RESULTS: Kill or suppress wild mustard.
11. EFFECTS OF RAINFALL: Do not spray if rain is expected within 4 hours.
12. MOVEMENT IN SOIL: Not applicable.
13. GRAZING AND CROPPING RESTRICTIONS: Avoid drift. No restrictions on grazing crop use after hail, or succeeding crops.
14. TOXICITY: - Very low acute mammalian toxicity; oral LD<sub>50</sub> rats = 3,000 mg/kg; may irritate skin and eyes; not toxic to birds; slightly toxic to fish.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2); use standard first aid measures (see page 3) to clean skin and eyes. If irritation persists see a doctor. If swallowed, induce vomiting and get medical attention.
16. STORAGE: Heated storage is essential.

## PRACTICAL USE CONSIDERATIONS

Although not registered, and hence not claimed - control of chickweed and cleavers may be expected.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**BLADEX (cyanazine)**  
Ciba Geigy

1. FORMULATIONS: Wettable powder- 80%, 5 kg bag. Liquid - 480 g/L, 10 L pack.
2. REGISTERED MIXES: With atrazine, Dual Ciba-Geigy 960E.
3. CROPS: Corn (field and sweet) (9.0).
4. WEEDS CONTROLLED: Annual smartweeds, barnyard grass (3.2), black nightshade, common ragweed, green and yellow foxtail (6.8), knotweed, lamb's-quarters, purslane, prostrate pigweed (6.7), redroot pigweed (6.2), shepherd's purse, wild buckwheat, mustard (wild, wormseed).
5. WEEDS SUPPRESSED: None.
6. WHEN USED: Pre-emergent, follow in 5-7 days with irrigation.
7. HOW TO APPLY:  
**With:** Ground equipment.  
**Rate:** Bladex 80W - 1.1-1.7 kg/ac (2.8-4.3 kg/ha), Bladex Liquid - 1.9-2.8 L/ac (4.8-7.0 L/ha), or Bladex 80W 0.9-1.1 kg/ac (2.3-2.8 kg/ha) or Bladex Liquid 1.5-1.9 L/ac (3.8-4.8 L/ha) plus 600-900 g/ac (1.5-2.3 kg/ha) Atrazine 80W. Use lower rates for light textured soils and higher rates for loams.  
**Cost:** Bladex 80W - \$12/kg - Bladex Liquid - \$8/L.  
**Water Volume:** 60-120 L/ac (150-300 L/ha).  
**Pressure:** 200-300 kPa  
**Ground Speed:** No restriction.
8. SPRAYING TIPS:
  - (a) Do not use Bladex on soils with more than 70% sand or less than 1% organic matter.
  - (b) Add Bladex slowly, to part tank of water, with agitator running.
  - (c) Tank mix with atrazine - premix in a pail, add pre-mix to tank of water, agitate, then add Bladex.
  - (d) Use metal filter and strainers and screens larger than 50 mesh.
9. HOW IT WORKS: Active through root uptake, requires moisture to carry to root zone. Interferes with photosynthesis.
10. EXPECTED RESULTS: Weeds fail to emerge or die before reaching 2 to 3 leaf stage.
11. EFFECTS OF RAINFALL: Rainfall or irrigation required for activation. Heavy rainfall on very sandy soil may cause leaching and reduce effectiveness.
12. MOVEMENT IN SOIL: Negligible unless excess moisture on very sandy soil.
13. CROPPING AND GRAZING RESTRICTIONS: Where atrazine mix is used corn should follow corn.
14. TOXICITY: Slightly high acute mammalian toxicity. Oral LD<sub>50</sub> - rats - 334 mg/kg. Low toxicity to fish and birds.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). Use standard first aid measures (see page 3) to clean skin and eyes. If swallowed, induce vomiting and get medical aid.
16. STORAGE: Bladex 80W in a dry place, Bladex Liquid in heated storage.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**BLAGAL (cyanazine + MCPA-K)**  
Ciba Geigy

1. FORMULATIONS: Suspension - 125 g/L of cyanazine and 250 g/L MCPA-K. 2 - 10 L jugs/pack.
2. REGISTERED MIXES: None.
3. CROPS: Spring wheat (8.7), barley (8.5), oats (9.0), flax (8.1). Underseeding: Not recommended.
4. WEEDS CONTROLLED: Chickweed (7.6), corn spurry (8.4), hemp-nettle (7.9), lamb's-quarters (8.7), mustard (ball, tumble, wild, wormseed) (8.7), redroot pigweed (6.1), annual smartweeds, stinkweed (8.7), tartary buckwheat (8.2), wild buckwheat (7.2) plus MCPA-K susceptible weeds.
5. WEEDS SUPPRESSED: Canada thistle, horsetail.
6. WHEN USED: Cereals - 2 to 5 leaf stage; flax - 5-10 cm high. Canada thistle - delay application until cereals have reached 5 leaf stage.
7. HOW TO APPLY:
  - With:** Ground equipment at speeds of 8km/h or less.
  - Rate:** 910 mL/ac (2.3 L/ha).
  - Cost:** \$6/L
  - Incorporation:** Not applicable.
  - Water Volume:** At least 40 L/ac (100 L/ha)
  - Nozzles:** Flat fan, screens 50 mesh or larger. Do not use flooding tips.
  - Pressure:** 275 kPa
8. SPRAYING TIPS:
  - (a) Application after 5 leaf stage may cause serious crop injury and give poor weed control.
  - (b) Vigorous agitation necessary if the solution stands for several hours before spraying.
  - (c) Boom Angle: Direct spray straight down.
  - (d) Allow 4 days before or after wild oat herbicide application.
9. HOW IT WORKS: Cyanazine and MCPA-K act synergistically to disrupt metabolism and inhibit photosynthesis.
10. EXPECTED RESULTS: Weeds: Yellow blotches first appear in 5-10 days then the whole plant turns yellow and brown and dies. Young vigorously growing plants affected first. Residual activity for about four weeks.  
Crop: Under moisture or temperature stress, Blagal may cause temporary yellowing of lower leaves.  
Conditions under which poor results may be expected:
  1. Reduced application rate.
  2. Poor penetration through dense crop canopy.
  3. Extremely poor growing conditions (drought).
  4. Late application.
11. EFFECTS OF RAINFALL: Rain within 4 hours will seriously reduce activity.
12. MOVEMENT IN SOIL: Not applicable.
13. GRAZING AND CROPPING RESTRICTIONS: Grazing restrictions: Do not graze or feed green plants to livestock. Crop use after hail: Use if mature. Succeeding crops: No restrictions.
14. TOXICITY: Low acute mammalian toxicity. Cyanazine - oral LD<sub>50</sub> (rats) - 334 mg/kg; MCPA - oral LD<sub>50</sub> (rats) - 700 mg/kg. Non toxic to fish, birds and bees.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) to avoid contact with skin or eyes. Use standard first aid measures (see page 3) if accidental skin and eye exposures occur. If swallowed, induce vomiting, and get medical aid.
16. STORAGE: Do not freeze as contents will crystallize. To re-suspend, warm and agitate.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**BROMINAL M - BROMOX 450 - SABRE - BUCTRIL M - (bromoxynil + MCPA)**  
 Allied — May and Baker

1. FORMULATIONS: Emulsifiable concentrate

<b>Brominal M</b>	<b>Bromox 450</b>	<b>Sabre</b>	<b>Buctril M</b>
bromoxynil - 225 g	bromoxynil - 225 g	bromoxynil - 360 g	bromoxynil - 281 g
MCPA - 225 g/L	MCPA - 225 g/L	MCPA - 360 g/L	MCPA - 281 g/L
Container Size			
20 L	10 L	12.5 L	28 L

2. REGISTERED MIXES:

Avenge MCPA ester	Avenge MCPA Ester	Avenge MCPA Ester Poast + Assist oil concentrate	Asulox F atrazine Avenge MCPA Ester, TCA (Barley, oats)
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Mixing restrictions:

1. With MCPA - with agitator running add bromoxynil to ½ of the water then add rest of water and MCPA.
2. With Avenge - As above, adding Avenge last.
3. Buctril M with Asulox F or TCA. Add Buctril M to the already prepared mix of Asulox F or TCA.
4. Sabre with Poast - As in (1) adding Sabre last.

3. CROPS:

Brominal M: Spring wheat (8.6), barley (8.8), oats (8.8), flax (8.4), canary seed (8.5).  
 Bromox 450: As above, durum, winter wheat, fall rye.  
 Sabre: Spring, durum, winter wheat (spring or fall application)(8.6), barley (8.8), oats (8.8), fall rye, flax (8.4), field and sweet corn (9.0), canary grass (8.5) - seedling grasses, year of establishment - grown for seed -bromegrass (8.9), crested, intermediate, slender, tall wheat grass (8.5), Russian wild ryegrass (9.0), timothy (8.8), orchard grass (8.9), creeping red and meadow fescue (8.3).  
 Underseeding: Not recommended

4. WEEDS CONTROLLED: Annual smartweeds (8.2), Bluebur, Tartary and wild buckwheat (8.1), common groundsel, cocklebur, common ragweed, cow cockle (7.8), flixweed, hemp-nettle\*, kochia (6.7), knawel, lamb's-quarters (8.6), ball, tumble, wild, wormseed mustard (8.4), Russian thistle (7.4), redroot pigweed (7.9), scentless chamomile (7.6), shepherd's purse, stinkweed (8.9), volunteer rapeseed (8.7).

\* Tank mix with MCPA preferred.

5. WEEDS SUPPRESSED: Canada thistle and perennial sow-thistle.

6. WHEN USED: Cereals - 2 leaf to early flag leaf. Winter wheat, fall rye - After growth begins in spring to early flag leaf. Canary seed - 3-5 leaf. Flax - 5-10 cm. Buctril M (only) - 4-6 leaf on corn and 2-4 leaf on seedling grasses. Weeds - Before 5 leaf stage.

7. HOW TO APPLY:

**With:** Ground equipment or air.

**Rate:** Brominal M, Bromox 450, Buctril M: 510 mL/ac (1.3 L/ha), Sabre: 315 mL/ac (780 mL/ha).

**Water Volume:** Ground Equipment: 20 or more L/ac (50 or more L/ac). Air: 8 or more L/ac (20 or more L/ac). For Buctril M in corn use 80-120 L/ac (200-300 L/ha).

**Cost:** Brominal M, Bromox 450: \$10/L; Sabre: \$15/L; Buctril M: \$13/L.

**Pressure:** 275 kPa

**Nozzles:** Flat fan, capacity of 20 L/ac (50 L/ha). No flood tips.

8. SPRAYING TIPS:

- (a) Avoid spraying during a severe drought. Under conditions of high temperature and humidity, slight discolouration of cereals may occur but no effect on crop yields.
- (b) Flax is less tolerant than cereals, therefore do not spray flax in hot humid weather when day time temperatures are over 25-29°C.
- (c) Best results are achieved when weeds are sprayed in seedling stage, with good spray coverage.
- (d) Barley and oats: A tank-mix of 400 mL/ac Buctril M + 710 mL/ac TCA solution or 540 g/ac of NaTA (1.0 L/ha Buctril M + 1.75 L/ha TCA solution or 1.34 kg/ha of NaTA). Observe precautions and restrictions on both product labels.
- (e) Corn: Buctril M at 400 mL/ac (1.0 L/ha) rate applied as an overall spray to corn in the 4-6 leaf stage. Buctril M at 400 mL/ac (10 L/ha) plus Atrazine at 450-910 g active/ac (1.1-2.2 kg active ingredient/ha) for broader spectrum weed control. Do not add oil or surfactant. Add Atrazine to the tank first. Observe precautions and limitations of both product labels. Cultivation after application is not recommended.
- (f) Seedling Grasses (not underseeded to legumes in the year of establishment). Buctril M at 400 mL/ac (1.0 L/ha) rate may be applied in the 2-4 leaf stage in 60 L/ac (150 L/ha) of water.

9. HOW IT WORKS: Bromoxynil is a contact type herbicide, therefore, good spray coverage is essential. Inhibits photosynthesis and plant respiration. MCPA is absorbed through leaves and is readily translocated in the plant.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

10. EXPECTED RESULTS: Small burnt spots on the leaf can appear within hours, complete death takes up to 2 weeks.

Conditions under which poor results may be expected:

1. Poor coverage.
2. Poor penetration through crop canopy.

11. EFFECTS ON RAINFALL: No effect.

12. MOVEMENT IN SOIL: Not applicable.

13. GRAZING AND CROPPING RESTRICTIONS: No grazing or crop use restrictions.

14. TOXICITY: High mammalian toxicity oral LD<sub>50</sub> rats = 365 mg/kg - no identified human health problems - very toxic to fish and birds; non-toxic to bees

15. PRECAUTIONS AND FIRST AID: Wear standard protective clothing (see page 2) when applying. Use standard first aid measures to clean skin and eyes (see page 3). If swallowed, DO NOT induce vomiting. Get medical attention.

16. STORAGE: Heated storage. Buctril M may crystallize if frozen. If crystallization occurs, warm and agitate until crystals are dissolved.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**CALMIX (bromacil + 2,4-D)**  
Allied Chemical

1. FORMULATIONS: Pellets, Bromacil - 3% + 2,4-D 5% - 1.5 and 25 kg.
2. REGISTERED MIXES: None.
3. CROPS: Non-crop land only.
4. WEEDS CONTROLLED: Non-selective.
5. WEEDS SUPPRESSED: Not applicable
6. WHEN USED: Calmix may be used in any season.
7. HOW TO APPLY:

**With:** Calmix spreader or shaker.

**Rate:** 2.5 kg/100 sq. m. Annual weeds and perennial seedlings. 3.75 kg/100 sq. m. Shallow-rooted perennials. 5.0 kg/100 sq. m. Heavy perennial growth.

- Apply at the higher rate to heavier soils and/or to extend the growth control period.
- For spot treatment apply 375 g to about 1 sq. m. Repeat treatment when required.
- For treatment around power poles, treat 1.25 m around each pole. Use about 250 g/pole.

**Cost:** \$4/kg

8. SPRAYING TIPS:
  - (a) Do not use near lawns or flower beds.
  - (b) Do not apply closer than 1½ times the height of nearby trees.
9. HOW IT WORKS: Systemic action, enters plant via roots.
10. EXPECTED RESULTS: Vegetation turns brown and dies. No new growth will appear, resulting in bare ground. Duration of control will depend upon amount of chemical applied, soil type and environmental conditions.

Conditions under which poor results may be expected:

1. Inadequate application rate.
2. Soil erosion removes chemical from treated area when applied on slopes.
3. Insufficient rainfall to activate chemical.

11. EFFECTS OF RAINFALL: Moisture will activate and carry the herbicide into the root zone.
12. MOVEMENT IN SOIL: Once fixed in the soil there is very little lateral movement. Pellets can be carried by erosion.
13. GRAZING AND CROPPING RESTRICTIONS: Not applicable.
14. TOXICITY: Low acute mammalian toxicity: bromacil: oral LD<sub>50</sub> rats = 5,200 mg/kg. 2,4-D: oral LD<sub>50</sub> rats = 375 mg/kg. Slight toxicity to fish; non-toxic to birds.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing to avoid exposure to dust (see page 2). Use standard first aid measures (see page 3) to clean skin and eyes.
16. STORAGE: Store in dry area.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**CARBYNE 2EC (barban)**  
**Velsicol**

1. FORMULATIONS: 240 g/L emulsifiable concentrate, 19 L container
2. REGISTERED MIXES: Carbyne 2EC + Avenge 200C
3. CROPS: Wheat (spring, durum) (8.9), barley (8.8), canola (8.9), flax (7.7), sugar beets (9.0), peas (field and processing) (8.8), fababeans (8.7), sunflowers (8.6), mustard (8.9), lentils (8.4), alfalfa (8.7), alsike clover (9.0), red clover (9.0), sweet clover (6.0), smooth bromegrass (8.2), Russian wild ryegrass (8.1); seedling grasses for seed only: timothy (8.3), creeping red fescue (8.9), crested wheatgrass (8.6). Underseeding: With crops listed above.
4. WEEDS CONTROLLED: Wild oats (6.6)
5. TIMING:

**Crop:**

Wheat (spring, durum), barley, lentils  
Canola, sugar beets, fababeans in sunflowers, mustard  
Flax  
  
Peas  
Forages, legumes, grasses

**Stage:**

Before the 4-leaf stage or the 14th day after emergence which ever is first.  
When the wild oats are the 2-leaf stage.  
After the 2 leaf stage but prior to the 12-leaf stage or before 14 days after emergence.  
Before the 6-leaf stage.  
Before the 4-leaf stage.

**Weed:**

Wild oats

2-leaf stage or before 9 days after emergence. When growth is slow, prior to the 14th day after emergence. Carbyne + Avenge Mix 3-4 leaf stage.

6. APPLICATION:

**With:** Ground or Aircraft

**Rate:** 600-700 mL/ac (1.5-1.8 L/ha) on all crops. Use higher rate when the wild oat density is 50 plants per square meter or more, or when wild oats are not actively growing, or when wild oats have been injured by frost or wind. Carbyne + Avenge Mix Carbyne 2EC 340 mL/ac (850 mL/ac + Avenge 200C 800 mL/ac (2.0 L/ha).

**Cost:** \$16/L.

**Water Volume:** Ground: 18 L/ac (45 L/ha)  
Carbyne + Avenge Mix: 25-30 L/ac (60-80 L/ha)  
Aircraft: 10-18 L/ac (25-45 L/ha)

**Pressure:** 300 kPa (minimum)

**Ground Speed:** 6.5 km/h

**Nozzles:** Tee Jet 650067, 730067, 800067; Monarch 20 and 22; Spray Jet 65.067, TK.75 or D.75.

7. SPRAYING TIPS:

- (a) Wild oats seedlings will produce a new leaf every five days and under good growing conditions reach the 2-leaf stage 4 to 9 days after emergence. The degree of control is dependent upon the uniformity of emergence of the wild oats.
- (b) There are no restrictions on applications of other pesticides after the Carbyne treatment; for the Carbyne + Avenge mix allow a 4-day interval between the application of this mix and the use of esters of bromoxynil, 2,4-D or MCPA.
- (c) Do not apply when the crop is wet with dew or rain.
- (d) Crop damage may occur if sprayed within 24 hours of frost.

8. HOW IT WORKS: A partially systemic herbicide: penetrates the leaf and stem surfaces of the wild oat plant, interfering with cell division.
9. EXPECTED RESULTS: Wild oat growth stops and leaves turn blue-green within 7-10 days. A swelling of the stem at ground level may occur. Leaf tips turn brown, the plant becomes brittle, dying 3-4 weeks after treatment.
10. EFFECT OF RAINFALL: Rainfall within 15 minutes after application may decrease control.
11. GRAZING AND CROPPING RESTRICTIONS: Drift: The hazard is low, however, common oats, buckwheat and rye can be seriously affected. Grazing Restrictions: Do not graze or feed crop for 5 weeks after treatment.
12. TOXICITY: Has a very low acute toxicity to mammals: oral LD<sub>50</sub> rats - 2,750 mg/kg  
- long-term exposure to this product has sensitized some people to it  
- very toxic to fish
13. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2.) Use standard first aid measures (see page 3) to clean skin and eyes. If swallowed DO NOT induce vomiting. Seek medical attention.
14. STORAGE: May be stored at freezing temperatures but must be returned to its original state by warming to room temperature and agitating thoroughly.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**CASORON (dichlobenil)**  
**Pfizer**

1. FORMULATIONS: Granular - 4% - 25 kg pack
2. REGISTERED MIXES: None
3. CROPS: Raspberries, caragana shelterbelts, ash, crabapple, cutleaf weeping birch, honeysuckle, juniper, maple, white cedar, willow.
4. WEEDS CONTROLLED: Annual bluegrass, chickweed, foxtail, groundsel, horsetail, knotweed, lamb's-quarters, mustard, purslane, pigweed, shepherd's-purse, smartweed.
5. WEEDS SUPPRESSED: None.
6. WHEN USED: Apply on crops established for at least one season.
7. HOW TO APPLY:  
**With:** Ground granular applicator.  
**Rate:** 45-70 kg/ac (110-175 kg/ha) - based on area actually treated. Apply in late fall but before soil freeze-up. Do not use on light soil.  
**Cost:** \$5/kg  
**Incorporation:** Ground Speed: Not applicable.
8. SPRAYING TIPS: Not applicable.
9. HOW IT WORKS: Snow melt or rain leaches Casoran into the soil. Casoran inhibits germination but acts primarily on growing points and root tips.
10. EXPECTED RESULTS: Growth of emerging shoots of some perennials suppressed. Tolerant crops are unaffected if roots do not come in contact with Casoran in the upper layers of the soil.
11. EFFECTS OF RAINFALL: If it's dry, poor results can be expected.
12. MOVEMENT IN SOIL: Some movement in coarse-textured soils.
13. GRAZING AND CROPPING RESTRICTIONS: Do not transplant into treated soil for one year.
14. TOXICITY: Very low mammalian toxicity. Oral LD<sub>50</sub> rats - 3160 mg/kg. Slightly toxic to fish.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) to avoid skin and eye contact. Use standard first aid measures to clean skin and eyes (see page 3).
16. STORAGE: Dry storage - not affected by frost.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**CO-OP GRANULAR SOIL STERILANT**  
**Federated Co-operatives**

1. FORMULATIONS: Dry granule - Sodium Metaborate Tetrahydrate 66.5%, Sodium Chlorate 30%; Diuron 1.25% - 1.4 and 22.7 kg packs.
2. REGISTERED MIXES: None
3. CROPS: Use where long term, total vegetation control is desired.
4. WEEDS CONTROLLED: All growth.
5. WEEDS SUPPRESSED: Not applicable.
6. WHEN USED: Use in early spring when weeds are small or in fall when weeds are dormant.
7. HOW TO APPLY:  
**With:** Shaker can, mechanical spreader or knapsack sprayer.  
**Rate:** Annual weeds - 0.5-1 kg per 10 m<sup>2</sup> - for dry application apply when rain is expected or water in.  
Persistent perennial weeds - 1-2 kg per 10 m<sup>2</sup> - either at maturity of weed or on damp soil in spring. Use higher rates on deep rooted perennials.  
**Cost:** \$3/kg
8. SPRAYING TIPS:  
Limitations
  - (a) Do not apply in hot, dry weather.
  - (b) To avoid fire hazard from dead and dry vegetation, treat when weeds are small. If growth is well advanced, mow and rake before treatment.  
Do not apply on or near desirable plants or on areas into which their roots may extend, or in locations where the chemical may be washed or moved into contact with their roots.
  - (c) Dried chemical residue on organic matter can be explosive.
  - (d) Spray solution will damage leather.
9. HOW IT WORKS: Kills through contact action. Persists in the soil and provides prolonged control of germinating seedlings and re-growth from perennial roots. Length of control depends on: species, rate, soil type, rainfall, vegetation cover, and time of application.
10. EXPECTED RESULTS: Seedlings are controlled quickly. Slower kill on perennial weeds.
11. EFFECTS OF RAINFALL: Rainfall will move the chemical into the soil and enhance its activity; in areas of high rainfall or sandy soils, the residual effect is reduced due to leaching.
12. MOVEMENT IN SOIL: Limited.
13. GRAZING AND CROPPING RESTRICTIONS: Treated area will be rendered more or less unproductive for one or more years.
14. TOXICITY: Very low acute mammalian toxicity - Oral LD<sub>50</sub> 2300-3500 mg/kg (rats). May cause irritation of eyes, nose, throat and skin.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) and goggles. Use standard first aid measures (see page 3) to clear skin and eyes. Induce vomiting if swallowed. Get medical attention.
16. STORAGE: Store in cool, dry place. Avoid direct contact with ground or concrete floors when storing.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**2,4-D**  
**Numerous manufacturers**

1. FORMULATIONS: 2,4-D ester - 800 g/L; 2,4-D low volatile ester - 500, 600, 700 g/L; 2,4-D amine - 500 g/L. 20 L containers.
2. REGISTERED MIXES: 2,4-D + atrazine and related triazines, bromoxynil, dalapon, dicamba, picloram, sodium TCA: 2,4-D ester + Avenge 200C, Stampede 360 on spring and durum wheat. Some formulations can be mixed with liquid fertilizer (28-0-0)
3. CROPS: Spring wheat (8.7), winter wheat (9.0), barley (9.0), rye, corn, flax, established seed grasses, grass pasture, turf, asparagus.
4. WEEDS CONTROLLED: Note: First rating amine; second rating ester.

Annual sunflower  
 Bluebur  
 Burdock  
 Cocklebur  
 Flixweed (7.8) (7.8)  
 Goat's-beard  
 Kochia (5.7) (6.8)  
 Lamb's-quarters (7.7) (8.0)  
 Mustard (8.0) (8.0)  
 (except dog and green tansy)  
 Peppergrass (common)  
 Pigweed (prostrate, Russian)(7.0)  
 Plantain  
 Prickly lettuce  
 Purslane  
 Ragweeds  
 Shepherd's-purse (8.6) (8.0)  
 Sow-thistle (annual)  
 Stinkweed (8.1) (8.0)  
 Sweet clover  
 Vetch  
 Wild radish

**Hard to Kill Weeds:**  
 Bindweed (hedge)  
 Dandelion  
 Docks  
 Gumweed  
 Hairy galinsoga  
 Mustard (dog)  
 Oak-leaved goosefoot

**Top Growth Control:**  
 Bindweed (field)  
 Blue lettuce  
 Canada thistle  
 Field horsetail  
 Leafy spurge  
 Pigweed (redroot)  
 Sow-thistle (perennial)

5. WEEDS SUPPRESSED: Field peppergrass, biennial wormwood, pineapple weed, Russian thistle.

6. WHEN USED: Wheat, Barley, Rye: 3 leaf to just before the flag leaf. Flax (linseed) (Amine only): From 5 cm to before the bud stage. Corn (Amine only): Between emergence and 15 cm tall. Use drop nozzles to keep spray off foliage. Grass pasture and turf: Seedling weeds. Asparagus (Amine only): Cultivate, then apply before first spears appear. Could repeat after harvest.

7. HOW TO APPLY:

**With:** Aircraft or ground equipment

**Rate:**

**FORMULATION AND CONCENTRATION**

Crop	RATE	
	Amine 500 Rate/ac (Rate/ha)	Ester 500 Rate/ac (Rate/ha)
Wheat, barley, rye	280-450 mL (700-1100 mL) *510-730 mL *(1.3-1.8 L)	280-710 mL (70-1750 mL) *510-730 mL *(1.3-1.8 L)
Flax	280-450 mL (700-1100 mL)	Not Recommended
Corn (at emergence) post-emergence	610 mL (1.5 L) (220-450 mL) (550-1100 mL)	Not Recommended
Established grass	450-810 mL (1.1-2.0 L)	610-710 mL (1.5-1.7 L)
Grass pasture & turf	610 mL-1.7 L (1.5-4.2 L)	810 mL-1.4 L (2.0-3.5 L)
Asparagus	1.4 L (3.5 L)	Not Recommended

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

Crop	RATE		
	Ester 600 Rate/ac (Rate/ha)	Ester 700 Rate/ac (Rate/ha)	Ester 800 Rate/ac (Rate/ha)
Wheat, barley, rye	240-610 mL (600-1500 mL) *510-730 mL *(1.3-1.8 L)	160-510 mL (470-1250 mL) *510-730 mL *(1.3-1.8 L)	160-460 mL (400-1140 mL) *510-730 mL *(1.3-1.8 L)
Flax Established grass	— 340-610 mL (850 mL-1500 mL)	— —	— (600-1100 mL)
Grass pasture & turf	610 mL-1.11 L (1.5-2.7 L)	610 mL-1.01 L (1.5-2.5 L)	610-810 mL (1.5-2.0 L)
Asparagus	Not Recommended	Not Recommended	Not Recommended

For registered mixes of 2,4-D Ester 500 with Avenge 200C - use up to 450 mL/ac (1.1 L/ha) of 2,4-D Ester 500 with 1.4-1.7 L/ac (3.5-4.2 L/ha) of Avenge 200C. For tank mix with Stampede 360 for use on spring and durum wheat only, use 1100 mL/ac (2.7 L/ha) Stampede 360 + 320-490 mL/ac (800-1200 mL/ha) 2,4-D Ester 500 or equivalent OR 1100 mL/ac (2.7 L/ha) Stampede 360 + 490 mL/ac (1.2 L/ha) 2,4-D amine 500.

\* Note: Higher rates can be used if weed infestation is high, but some crop injury may occur.

**Cost:** \$4/L

**Water Volume:** Aircraft: minimum 8 L/ac (20 L/ha)

**Ground:** Wheat, barley, rye, oats, corn - 40 L/ac (100 L/ha). Flax (linseed) - minimum 40 L/ac (100 L/ha) of water. Grass Pastures and Turf - 160 L/ac (400 L/ha) for thorough coverage.

**Pressure:** 275 kPa

**Ground Speed:** 9 km/h

8. **SPRAYING TIPS:** Spray during warm weather when the weeds are young and growing actively. At high temperatures vapourization of more volatile esters may cause injury to susceptible plants.
9. **HOW IT WORKS:** This hormone type herbicide causes abnormal growth, and affects respiration, food reserves and cell division in broadleafed plants. Absorbed primarily by leaves and stems and translocated to the growing tips and roots.
10. **EXPECTED RESULTS:** Susceptible plants become malformed before they die.
11. **EFFECTS OF RAINFALL:** A rain free period of 2 hours for esters, 4 hours for amine and 6 hours for salts.
12. **MOVEMENT IN SOIL:** Leaching does not pose a problem.
13. **GRAZING AND CROPPING RESTRICTIONS:** Do not use on bent grasses or on freshly seeded turf. Avoid spray drift onto vegetables, flowers, grapes, fruit trees, ornamentals or other desirable plants. Succeeding Crops: No restrictions
14. **TOXICITY:** Has moderate acute toxicity to mammals; oral LD<sub>50</sub> rats = 300-1000 mg/kg. Some formulations may cause skin irritation. Some formulations are toxic to fish and should not be introduced into aquatic environments.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page 2) and goggles to reduce exposure. Use standard first aid measures (see page 3) to clean skin and eyes. If amine formulations are swallowed, induce vomiting. If ester formulations are swallowed, do not induce vomiting. In all cases, see a doctor.
16. **STORAGE:** Do not freeze amine, if frozen warm to 4°C and mix thoroughly before using. Store away from fertilizers, feeds, foodstuffs, seeds, insecticides or fungicides.

## PRACTICAL USE CONSIDERATIONS

1. DRIAMINE 80% SG a soluble, granule formulation of 2,4-D containing 80% active 2,4-D amine is now available.
2. 2,4-D may be used on Brome and Fescue crops grown for seed, in other than the seedling year. Conditions for use are:
  - (a) Spray prior to shot blade stage.
  - (b) Use amine formulation and not more than 0.445 kg/ac (1.1 kg/ha) active ingredient.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**2,4-D (Industrial)**  
**Dow**

1. FORMULATIONS: Low volatile ester - 564 g/L in 20 L pails.
2. REGISTERED MIXES: Mixing restrictions: Diesel oil, No. 2 fuel oil, kerosene, or water can be used as a carrier. With agitator running add ½ of the carrier, add herbicide then the remainder of the carrier. When using oil carriers **do not** allow water to get into product or spray tank.
3. CROPS: Industrial and forestry locations.
4. WEEDS CONTROLLED: Alder, balsam, poplar, trembling aspen, birch, elm, cherry, hazelnut, sumac, Manitoba maple, willow.
5. WEEDS SUPPRESSED: Canada thistle, field bindweed.
6. WHEN USED: Foliar treatment - after foliage is fully developed. Stump treatment - On freshly cut stump anytime including winter. Basal Bark Treatment - Any time. Do not cut for one year after application.
7. HOW TO APPLY:

**With:** Aircraft or ground equipment.

**Rates:** Foliar treatment: 8 L in 1000 L of water  
Stump treatment: 30 L in 1000 L of diesel fuel  
Basal bark treatment: 20-30 L in 1000 L of diesel fuel

**Aircraft:** Apply above proportions in 12 L/ac (30 L/ha).

**Incorporation:**

**Pressure:** Ground - up to 1700 kPa. Aircraft - 235 kPa.

**Ground Speed:**

**Nozzles:**

8. SPRAYING TIPS:

- Spray during warm weather when weeds and brush are actively growing.
- Continuous agitation is required for the oil-water mixture.
- Do not apply by air in dead-calm as the "cloud" of suspended droplets may drift when wind comes up.

9. HOW IT WORKS: Absorbed through leaves and bark in trees. A hormone type herbicide causing an abnormal growth.
10. EXPECTED RESULTS: Brown crisp leaves first appear then complete death.
11. EFFECTS OF RAINFALL: A rain free period of 4-6 hours.
12. MOVEMENT IN SOIL: Minimal soil movement. 30 day half-life.
13. GRAZING AND CROPPING RESTRICTIONS: Use only on established turf grasses except creeping grasses such as bentgrass. Avoid spray drift.
14. TOXICITY: High acute toxicity to mammals; oral LD<sub>50</sub> rats = 300-1000 mg/kg. No dioxin is present. Some formulations may cause skin irritation. Toxic to fish and should not be introduced into aquatic environments.
15. PRECAUTIONS AND FIRST AID: Wear standard protective clothing (see page 2) and goggles to reduce exposure. Use standard first aid measures (see page 3) to clean skin and eyes when heavily contaminated. If swallowed, do not induce vomiting; see a doctor immediately.
16. STORAGE: Store away from fertilizers, seeds, insecticides, fungicides or other herbicides intended for use on 2,4-D sensitive crops. If frozen, warm and agitate to resuspend.
17. PRACTICAL USE CONSIDERATIONS: Oil mixes are very expensive and use would be limited to small areas, dormant season spray.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**DESORMONE 7, DIPHENOPROP 700, SILVAPROP 700 (2,4-D + dichlorprop)**  
Allied, Pfizer, May and Baker

1. FORMULATIONS: Emulsifiable concentrate - 2,4-D - 350 g/L + 2,4-DP - 350 g/L - 20 L container.
2. REGISTERED MIXES: None
3. CROPS: Non crop land, industrial areas, rights of way, roadsides.  
Underseeding - Not applicable.
4. WEEDS CONTROLLED: Brush: Alder, aspen, birch, buckbrush, elderberry, honeysuckle, poplar, sumac, wild cherry, willow. Weeds: Burdock, Canada thistle, perennial sow thistle, tansy, toadflax, curled dock and annual broadleaf weeds.
5. WEEDS SUPPRESSED: None.
6. WHEN USED: Throughout growing season.
7. HOW TO APPLY:  
**With:** Power equipment, knapsack sprayer, aircraft.  
**Rate:** Brush: 8.5-11.0 L in 1000 L of water for foliage stem treatment. Weeds: 80-200 L/ac (200-500 L/ha).  
**Cost:** \$7/L  
**Water Volume:** Spray to point of run-off. For fixed wing application - not less than 8 L/ac (20 L/ha) - water may be replaced by oil.  
**Pressure:** As recommended for equipment used.  
**Nozzles:** No restrictions.
8. SPRAYING TIPS:
  - (a) With agitator running, add herbicide to  $\frac{1}{2}$  carrier then add rest of carrier.
  - (b) If used in oil, do not let water get in mixture.
  - (c) Forms an emulsion in water - agitate to prevent separation.
9. HOW IT WORKS: A translocated, systemic herbicide absorbed by leaves.
10. EXPECTED RESULTS: Leaves brown and wilt shortly after spraying - no leaves appear the following year.
11. EFFECTS OF RAINFALL: Rain within 3 or 4 hours after application may reduce control.
12. MOVEMENT IN SOIL: Not applicable.
13. GRAZING AND CROPPING RESTRICTIONS: Drift over susceptible crops causes injury - no grazing restrictions.
14. TOXICITY: Low acute mammalian toxicity - 2,4-D - oral LD<sub>50</sub> (rats) - 375 mg/kg; dichlorprop - 875 mg/kg. 2,4-D present contains no dioxin. Do not apply when bees are foraging.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). Use standard first aid measures (see page 3) if skin and eye exposure occurs. If swallowed do not induce vomiting. Get medical attention.
16. STORAGE: If frozen, warm to 5°C and mix well.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**DUAL CIBA GEIGY 960E (metolachlor)**  
Ciba Geigy

1. FORMULATIONS: Emulsifiable concentrate - 960 g/L - 10 L pack.
2. REGISTERED MIXES: May be applied as split application or tank mixed as follows.  
 Corn - with Aatrex Liquid, Aatrex Nine-O, Aatrex 90W, Aatrex 80W, Bladex 80W, Bladex Liquid, Banvel, Kil-Mor and Estemine 2,4-D: split application only. Liquid nitrogen - 28% nitrogen solutions or complete liquid fertilizers may replace all or part of the water for pre-plant incorporated or pre-emergent application of Dual tank mixes in corn. Dry Bulk Granular Fertilizers - impregnate on fertilizer, soil apply then incorporate to 5 cm.  
 Potatoes - with Patoran 50W, Patoran 670 Flowable and Sencor 500 Flowable.
3. CROPS: All corn, potatoes, white beans.
4. WEEDS CONTROLLED: Barnyard grass, green and yellow foxtail plus weeds controlled by the second material in mix or oversprayed.
5. WEEDS SUPPRESSED: None.
6. WHEN USED: Pre-plant incorporated (PPI).
7. HOW TO APPLY:

**With:** Ground equipment - band or overall spray.

**Rate:** Potatoes, white beans - 0.8-1.1 L/ac (2.0-2.7 L/ha)  
 Corn - Tank mixes of Dual Ciba Geigy 960E

Weeds Controlled	Timing	DUAL CIBA-GEIGY 960E Rate/ac (Rate/ha)	TANK MIXES Rate/ac (Rate/ha)
Annual grasses and	ppi*	0.9-1.1 L/ac (2-2.7 L/ha)	500-700 mL/ac + (1.3-1.7 kg/ha) Aatrex Nine-O or Aatrex 90W or 0.9-1.3 L/ac (2.3-3.2 L/ha) Aatrex Liquid or Bladex 80W or 1.5-2.2 L/ac (3.8-5.5 L/ha) Bladex Liquid or 600-800 mL/ac (1.5-2.0 kg) Aatrex 80W
Broad-leaf weeds	ppi & post**	0.9-1.1 L/ac (2-2.7 L/ha)	+ 345-445 mL/ac (0.85-1.1 L/ha) Kil-Mor or 285-445 mL/ac (0.7-1.1 L/ha) Estemine 2,4-D

\* pre-plant incorporated      \*\* post-emergence

**Cost:** \$17/L

**Water Volume:** 20-40 L/ac (50-100 L/ha)

**Incorporation:** Incorporate to 5 cm. Do not exceed this depth since product dilution can occur. If using tandem discs set to cut to a depth of 10 cm operated at 6 to 9 km/h. If using "S tine" (Danish) cultivators with tines on 15-20 cm centres, set 10 cm deep and operate at 9-13 km/h. Spike tooth or diamond tooth harrows are good incorporation equipment. Immediate incorporation is not necessary although desirable.

**Pressure:** 275 kPa

**Ground Speed:** 9 km/h

**Nozzles:** Standard nozzles delivering recommended volume.

8. SPRAYING TIPS:
  1. Do not tank mix with Kil-Mor or Estemine.
  2. For band treatments, use a press wheel ahead of the nozzle to level the band.
  3. Do not impregnate on nitrate fertilizers (ammonium, potassium, sodium, calcium) or on single superphosphate (0-26-0), triple superphosphate (0-46-0) or on ammonium phosphate nor on limestone. Fertilizer blends containing limestone may be impregnated.
9. HOW IT WORKS: Inhibits germination, particularly grasses.
10. EXPECTED RESULTS: Annual grasses do not germinate or under dry conditions may die back soon after emergence.
11. EFFECTS OF RAINFALL: Moisture required to move chemical to area of germination but an excess may move it below this area.
12. MOVEMENT IN SOIL: Some movement may occur if excess moisture or light soil.
13. CROPPING AND GRAZING RESTRICTIONS: Do not apply on muck, peat or high organic soils, or after growth has begun. Winter cereals may be seeded 4½ months after treatment.
14. TOXICITY: Very low acute mammalian toxicity - oral LD<sub>50</sub> - rats = 2780 mg/kg: slightly toxic to birds, non-toxic to fish. Prolonged exposure may cause eye injury.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (page 2). Use standard first aid measures (see page 3) to clean skin and eyes. If swallowed, do not induce vomiting - get medical attention.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**DYCLEER (dicamba)**  
**Velsicol**

1. FORMULATIONS: DyCleer - 400 g dicamba DMA/L  
DyCleer 2:4 - 200 g dicamba DMA/L  
400 g 2,4-D amine/L
2. REGISTERED MIXES: DyCleer + 2,4-D (amine or L.V. ester).  
Mixing with other pesticides: Not recommended.
3. REGISTERED USES: Non-cropland use for control of broad-leaf weeds and brush.
4. BRUSH, WEEDS CONTROLLED: Deciduous and coniferous brush species and hard to kill annual and perennial weed species.
5. WHEN USED: *Deciduous species* - when leaves are fully expanded in June.  
*Coniferous species* - apply in June.  
*Broad-leaf weeds* - when actively growing, normally between May and July.
6. HOW TO APPLY:

**With:** Conventional boom sprayer, a handgun or boomless type sprayer. Thorough coverage essential.

**Rate:** Snowberry, wolfwillow, aspen, alder, wild rose: 2.5 L DyCleer plus 4 L of 2,4-D amine or ester 500 in 1,000 L water, or 5 L DyCleer 2:4 in 1,000 L water.

Balsam poplar, birch, black cottonwood: 5.0 L DyCleer plus 8 L of 2,4-D amine or ester 500 in 1,000 L water or 10 L DyCleer 2:4 in 1,000 L water.

Spruce, pine, balsam fir, tamarack: 5 L-10 L DyCleer 2:4 in 1,000 L water.

Top growth of absinth, Canada thistle, perennial sow-thistle, leafy spurge, poverty weed, scentless chamomile: 610 mL/ac (1.5 L/ha) DyCleer or 610 mL DyCleer + 900 mL 2,4-D. Amine or LV ester-500/ac (1.5 L DyCleer plus 2.2 L of 2,4-D amine or L.V. ester-500/ha) for additional broad-leaf control or 1100 mL/ac (2.7 L/ha) DyCleer 2:4.

Perennial sow-thistle, ragweed, goldenrod, tansy ragwort, Canada thistle, field bindweed, and top growth of curled dock: 1100 mL/ac (2.75 L/ha) DyCleer or 1100 mL of DyCleer + 900 mL 2,4-D amine or ester-500 (2.75 L DyCleer plus 2.2 L of 2,4-D amine or ester-500/ha) for additional broad-leaf control or 2.2 L/ac (5.5 L/ha) DyCleer 2:4.

Diffuse knapweed, goat's-beard, ground cherry, pasture sage, poverty weed: 2.2 L/ac (5.5 L/ha) DyCleer or 4.5 L/ac (11.0 L/ha) DyCleer 2:4.

Baby's breath, fringed sage brush, perennial cinquefoil and Russian knapweed: 4.5 L/ac (11.0 L/ha) DyCleer.

-TURF-

Clover, mouse-eared chickweed, erect knotweed: 610 mL/ac (1.5 L/ha) DyCleer or 610 mL DyCleer + 900 mL 2,4-D amine or ester-500 per acre (1.5 L DyCleer plus 2.2 L of 2,4-D amine or ester-500/ha) for additional broad-leaf weed control or 1100 mL/ac (2.75 L/ha) DyCleer 2:4.

Alder, aspen, balsam fir, birch, balsam poplar, spruce, willow: 20-28 kg/ac (50-70 kg/ha) DyCleer 10P.

**Water Volume:** Apply only in water for deciduous and coniferous brush. Rate/1,000 L of water applied to point of run-off. For broad-leaf weed control: 45-90 L/ac (110-220 L/ha). For turf: 45 L/ac (110 L/ha). For poison ivy control: 225 L/ac (560 L/ha).

7. SPRAY TIPS:

- (a) Thorough coverage of weed and wetting brush to the point of run-off is essential for control.
- (b) Brush and trees over 2 m should be cut and regrowth sprayed.
- (c) Do not mix with oils.

8. HOW IT WORKS: Dicamba is a systemic herbicide that is absorbed through roots or leaves and translocated in most plants. Disrupts the metabolic and growth activities in the plant.

9. EXPECTED RESULTS: Excellent control of brush can be expected within a year of application. Effect on broad-leaf weeds may be seen in 10-14 days resulting in twisting and bending of the main stem, cupping of leaves, increase in root size and stimulation of fibrous root production.

Precautions that should be followed:

1. Avoid applications if temperatures exceed 25°C to reduce risk of vapour drift.
2. Avoid applications onto soil over the root systems of desirable trees and shrubs.
3. Thoroughly clean application equipment after use.

10. EFFECTS OF RAINFALL: Rainfall within four hours after application will not reduce effectiveness.

11. MOVEMENT IN SOIL: Very little, can leach downward.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

## 13. GRAZING AND CROPPING RESTRICTIONS:

## GRAZING AND HAYING RESTRICTIONS FOR DAIRY CATTLE

Rate per acre	Rate per hectare	Days Delay Between Treatment and Grazing or Haying
Up to 600 mL/ac	Up to 1.5 L Dycleer	0
600 mL-1.1 L/ac	1.5-2.7 L Dycleer	7
1.11-2.2 L/ac	2.7-5.5 L Dycleer	14
2.2-4.5 L/ac	5.5-11.0 L Dycleer	30

1. If treated vegetation has been consumed by meat animals within 30 days of DyCleer application, feed the animals with untreated diet for 30 days before slaughter.

2. Meat animals may eat treated grass 30 days after DyCleer application without restrictions on slaughter.

14. TOXICITY: Has low acute mammalian toxicity; rats - oral LD<sub>50</sub> (dicamba DMA salt) = 2,600 mg/kg. Low toxicity to fish; non-toxic to bees.

15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) to reduce exposure. Use standard first aid to clean skin and eyes when heavily contaminated. If swallowed, induce vomiting; get medical attention.

16. STORAGE: Freezing, will cause crystalization but no activity is lost if completely resuspended.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**DYVEL (dicamba + MCPA-K)**  
**Velsicol**

1. FORMULATIONS: Water soluble solution 84 g/L dicamba and 336 g/L MCPA potassium salt; 10 L containers.
2. REGISTERED MIXES: None
3. CROPS: Barley (8.6), oats (9.0) and wheat (8.7).  
Underseeding: Legume underseeding not recommended.
4. WEEDS CONTROLLED: Hemp-nettle (6.5), cow cockle, wild buckwheat (7.1), green smartweed (7.7), lady's-thumb, corn spurry (5.6), Russian thistle (7.0), lamb's-quarters (8.6), pigweed (prostrate, redroot (8.8), Russian), mustard (8.8) (Indian, wild, wormseed), ragweed (common, giant), stinkweed (8.4) and cocklebur, also volunteer sunflowers, burdock, flixweed, ball mustard, hare's-ear mustard, tumble mustard, wild radish, false ragweed, shepherd's-purse, cleavers, kochia and Tartary buckwheat.
5. WEEDS SUPPRESSED: Canada thistle (6.8) and sow-thistle.
6. WHEN USED: 2-3 leaf stage of crop. Best results will be obtained on hemp-nettle, corn spurry and cow cockle if application is made at the 2 to 3 leaf stage of the crop when these weeds are young.
7. HOW TO APPLY:  
**With:** Ground equipment  
**Rate:** 510 mL/ac (1.2 L/ha)  
**Cost:** \$7/L  
**Water Volume:** 45 L/ac (110 L/ha)  
**Incorporation:** Not applicable  
**Pressure:** 275 kPa  
**Ground Speed:** 9 km/h  
**Nozzles:** Standard nozzles delivering 45 L/ac (110 L/ha)
8. SPRAYING TIPS:
  - (a) Do not spray if rain is expected within four hours of application.
  - (b) Best under good growing conditions and air temperature 10-25°C.
  - (c) Avoid application if risk of severe drop in night temperature is forecast.
  - (d) Avoid application when crop is under stress from disease or adverse environmental conditions.
  - (e) Crop damage can occur if the chemical is applied at any time other than the recommended crop stage.
9. HOW IT WORKS: DyVel is a systemic herbicide that is absorbed through the roots and leaves and translocated readily.
10. EXPECTED RESULTS: See inserts for dicamba and MCPA potassium salt.
11. EFFECTS OF RAINFALL: Rainfall four hours after application will not reduce effectiveness.
12. MOVEMENT IN SOIL: Not applicable.
13. GRAZING AND CROPPING RESTRICTIONS: Do not graze or harvest for livestock feed prior to crop maturity.
14. TOXICITY:
  - has very low acute mammalian toxicity; Dicamba: oral LD<sub>50</sub> rats = 1,707-2,900 mg/kg; MCPA: oral LD<sub>50</sub> rats = 700 mg/kg
  - non-toxic to birds, fish and bees
15. PRECAUTIONS AND FIRST AID: Wear standard protective clothing (see page 2) to cut down on exposure. Use standard first aid measures (see page 3) to clear skin and eyes. May cause some swelling to eyes. Induce vomiting if swallowed; get medical attention.
16. STORAGE: Protect from freezing but if frozen no activity is lost if completely resuspended.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**EMBUTOX E, 2,4-D BUTYRIC 400, COBUTOX 400 (2,4-DB)**  
May & Baker      Pfizer      Interprovincial Co-op

1. FORMULATIONS: Emulsifiable concentrate 400 g/L, 4 and 20 L.
2. REGISTERED MIXES: Embutox E + Asulox F (alfalfa only) Embutox E + MCPA (sodium and K Salts); Cobutox 400 + MCPA amine 2,4-D Butyric 400 - no registered mixes

Mix Restrictions: Add Embutox E to the Asulox F already pre-mixed in the spray tank.

3. CROPS: Alfalfa (8.0), bird's-foot trefoil, white and alsike clovers (8.9), seedling stage of legumes only - spring wheat (8.8), barley (9.0), oats (8.2), field corn, pastures (9.0).
4. WEEDS CONTROLLED: Bull thistle, cocklebur, curled dock (8.0), lamb's-quarters (8.4), mustard (ball, wild\* and wormseed) (5.8), narrow-leaved hawk's-beard\*, oak-leaved goosefoot, plantain, ragweed, redroot pigweed, shepherd's-purse, smartweeds (annual) (5.4), stinkweed, wild buckwheat (5.7), yellow rocket.  
*\* For better control use Embutox E + MCPA*

5. WEEDS SUPPRESSED: Canada thistle, field bindweed, perennial sow-thistle.

6. WHEN USED: Weeds - 1-3 leaf (seedling) stage. Seedling alfalfa, bird's-foot trefoil - 1-4 trifoliate leaf. Seedling white, alsike clover - after the first trifoliate leaf. Cereals - 5th leaf to the early flag leaf. Field corn - after crop is 38 cm high but before the beginning of tasselling. Pastures - after cutting or grazing, and before regrowth is 7.5 cm high.

7. HOW TO APPLY:

**With:** Ground equipment

**Rate:** 1.1-1.7 L/ac (2.8-4.2 L/ha)

**Cost:** \$6/L

**Water Volume:** 60-80 L/ac (150-200 L/ha)

**Pressure:** 275 kPa

**Ground Speed:** 9 km/h

**Nozzles:** All standard nozzles delivering 60-80 L/ac (150-200 L/ha)

8. SPRAYING TIPS:

- (a) Do not spray in drought conditions.
- (b) Damage to forage legumes (especially to established alfalfa) may occur and increase in severity the longer treatment is delayed beyond stage recommended.
- (c) Oats are sensitive if treated before the 5 leaf stage.
- (d) For control of narrow-leaved hawk's-beard\*, with Cobutox 400 apply 8.65 L/ac (3.5 L/ha) to rosettes in the fall after legume growth has ceased. For better wild mustard control - tank mix 0.8 L Embutox E + 30 mL MCPA salt/ac (2 L Embutox E with 70 mL of MCPA salt/ha) use on seedling alfalfa and bird's-foot trefoil - some crop stunting may occur.

9. HOW IT WORKS: Susceptible plants convert 2,4-DB to 2,4-D. Certain legumes do not convert it. 2,4-DB is translocated to actively growing parts.

10. EXPECTED RESULTS: Weeds should die within 2-3 weeks of treatment.

11. EFFECTS OF RAINFALL: Rainfall before the foliage has dried from the spraying may decrease activity.

12. MOVEMENT IN SOIL: Not applicable.

13. GRAZING AND CROPPING RESTRICTIONS: No grazing restrictions.

14. TOXICITY: Has very low acute mammalian toxicity, oral LD<sub>50</sub> rats = 1,960 mg/kg. Toxic to fish; non-toxic to birds and bees.

15. PRECAUTIONS, FIRST AID: Wear standard protective gear (see page 2). Use standard first aid measures (see page 3) to clean skin and eyes. If swallowed do not induce vomiting - get medical attention.

16. STORAGE: If Embutox E freezes it can be reactivated by warming to 20-22°C and agitating thoroughly. Do not freeze 2,4-D Butyric 400.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**EPTAM (EPTC)**  
**Chipman**

1. FORMULATIONS: Emulsifiable concentrate 800 g/L (Eptam 8-E), 20 L container. Granular (Eptam 10-G), 22.7 kg bag.
2. REGISTERED MIXES: Eptam 8-E + liquid fertilizer. Eptam 8-E + granular fertilizer (except for nitrate based fertilizer). Eptam 8-E + Lexone or Sencor (Irish potatoes)
3. CROPS: Alfalfa (9.0), bird's foot trefoil, dry beans (7.6), snap beans (8.6), flax (7.5), Irish potatoes (9.0), sunflowers (7.9), turnips (rutabagas) (8.0), sugar beets (8.3). Underseeding: Not recommended.
4. WEEDS CONTROLLED: Annual bluegrass (7.2), annual ryegrass (8.4), barnyard grass (8.6), green foxtail (7.7), yellow foxtail (8.4), yellow nutsedge, volunteer wheat (7.9), volunteer barley (6.9), volunteer oats, wild oats (8.1), witch grass, quackgrass (see label), common chickweed, corn spurry (9.0), henbit, lamb's-quarters (6.4), hairy nightshade (8.5), prostrate pigweed, redroot pigweed (6.3), tumble pigweed, purslane.
5. WEEDS SUPPRESSED: None
6. WHEN USED: *Alfalfa and Bird's-foot Trefoil (New Seedlings)* - Just prior to planting. Do not use if seeding a grain or grass nurse crop. *Beans, Snap or Dry (including Red Kidney Beans)* - Just prior to planting - Do not use on Adzuki beans, cow peas, soybeans, lima beans or other flat podded beans except Romano. *Flax, Sunflower (Spring)* - Just prior to planting. Do not apply in the spring on soils with less than 3% organic matter. *Flax, Sunflower (Fall)* - Just prior to freeze-up. The following spring, just prior to seeding, cultivate lightly to destroy any overwintering rosettes. *Potatoes* - Incorporate in the fall or spring, after drag-off, or just prior to the last cultivation. Eptam 8-E can also be metered into irrigation equipment (see label for exact and detailed instructions). Do not apply within 45 days of harvest. *Turnips* - Apply and incorporate 6-10 days prior to planting. Note - Fall application should not be used in areas where soil drifting is a hazard.

7. HOW TO APPLY:

**With:** Ground equipment or irrigation water.

**Rate:** *Alfalfa and Bird's-foot Trefoil* - 1.7 L/ac (4.2 L/ha) or 13.8 kg/ac (34 kg/ha) of Eptam 10-G.  
*Snap or Dry Beans* - 1.7-2.2 L/ac (4.3-5.5 L/ha) or 13.8-18.2 kg/ac (34-45 kg/ha) of Eptam 10-G.

*Flax - Spring Treatment*

- Light soil 1.4 L/ac (3.5 L/ha) or 11.3 kg/ac (28 kg/ha) Eptam 10-G.
- Heavy soil 1.7 L/ac (4.2 L/ha) or 13.8 kg/ac (34 kg/ha) Eptam 10-G.

*Flax - Fall Treatment*

- Light soil - 1.7 L/ac (4.2 L/ha) or 13.8 kg/ac (34 kg/ha) Eptam 10-G.
- Heavy soil - 2.2 L/ac (5.5 L/ha) or 18.2 kg/ac (45 Kg/ha) Eptam 10-G.

**Special Instructions for Flax** - Seed shallow, less than 3 cm, into a firm seedbed. Deep seeding reduces stands.

*Potatoes* - Before Planting, Drag-off - 1.7-3.4 L/ac (4.3-8.5 L/ha) or 13.8-27 kg/ac (34-67 kg/ha) Eptam 10-G. Post emergence - 1.7-2.2 L/ac (4.3-5.5 L/ha) or 13.8-18.2 kg/ac (34-45 kg/ha) Eptam 10-G. Sprinkler Irrigation - 1.7-2.3 L/ac (4.2-5.5 L/ha). Fall Treatment - 2.3-3.4 L/ac (5.5-8.5 L/ha).

*Sunflowers* - Spring 1.7 L/ac (4.2 L/ha) or 13.8 kg/ac (34 kg/ha) Eptam 10-G. Fall - 1.7-2.2 L/ac (4.3-5.5 L/ha) or 13.8-18.2 kg/ac (34-45 kg/ha) Eptam 10-G.

*Turnips* - Sandy soil - 1.3 L/ac (3.2 L/ha) or 9.1 kg/ac (22.5 kg/ha) Eptam 10-G.  
- Heavy soil - 1.7 L/ac (4.2 L/ha) or 13.8 kg/ac (34 kg/ha) Eptam 10-G.

**Cost:** Eptam 8-E - \$8/L. Eptam 10-G - \$1.12/kg.

**Water Volume:** 40 L/ac (100 L/ha)

**Incorporation:** Eptam 8-E or 10-G should be incorporated immediately. If using power-driven cultivation equipment, set the implement to cut 5-7.5 cm deep.

Tandem and One Way Discs - Set to cut 10-15 cm and operate at 6.5-9.5 km/h followed by harrows. Incorporation should be done twice in two different directions.

Field Cultivators - For lighter soils in good tilth. Use 3-4 rows of sweeps spaced no wider than 18 cm. Cut 10-15 cm deep at 9.5 km/h. The second incorporation must be made at a right angle to the first. Harrows should be pulled behind the cultivator.

**Pressure:** 275 kPa

**Ground Speed:** 9 km/h.

**Nozzles:** All standard and low pressure nozzles delivering approximately 40 L/ac (100 L/ha).

8. SPRAYING TIPS: When applying Eptam 8-E with granular fertilizer, a minimum of 81 kg/ac (200 kg/ha) of fertilizer is required. See product label for further instructions.
9. HOW IT WORKS: Eptam is taken up by the roots and shoots of a germinating weed where it disrupts and stops further growth.
10. EXPECTED RESULTS: Weeds: Since Eptam is absorbed by the weed shoot, most affected weeds will not emerge. Numerous chlorotic and bleached shoots may be visible by removing the top few inches of treated soil. It should provide effective weed control for approximately 6-8 weeks. Crops: If crop seedlings are weak, some injury may occur.
11. EFFECTS OF RAINFALL: Very soluble in water so excessive moisture may cause leaching.
12. MOVEMENT IN SOIL: Eptam will move readily in the soil.
13. GRAZING AND CROPPING RESTRICTIONS: None. Crop Use After Hail: No restrictions. Succeeding Crops: No restrictions.
14. TOXICITY: Has very low acute mammalian toxicity - oral LD<sub>50</sub> rats = 1,600 mg/kg. Very toxic to fish; non-toxic to birds.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) use standard first aid measures, (see page 3) to clean skin and eyes. If swallowed - do not induce vomiting - get medical attention.
16. STORAGE: Heated storage not required. Store away from seed and fertilizer.

**\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\***

**ERADICANE 8-E (Eptam + R25788)**  
Chipman

1. FORMULATIONS: Emulsifiable concentrate - 800 g/L, 22.7 L pack.
2. REGISTERED MIXES: With liquid fertilizer.  
Mix restrictions - check compatibility.  
Mixing with other pesticides - not recommended.
3. CROPS: Corn (field, sweet) (9.0)
4. WEEDS CONTROLLED: Annual bluegrass, annual ryegrass, barnyard grass (8.6), common chickweed, corn spurry, green foxtail (8.4), hairy nightshade, henbit, lamb's-quarters (9.0), pigweed (prostrate, redroot, tumble) (6.6), purslane, quackgrass, volunteer barley (7.0), volunteer oats, volunteer wheat (9.0), wild oats (8.1), yellow foxtail.
5. WEEDS SUPPRESSED: None.
6. WHEN USED: Apply and incorporate and seed corn as soon as possible.
7. HOW TO APPLY:

**With:** Ground equipment

**Rate:** Field corn - 1.7-3.3 L/ac (4.3-8.2 L/ha)  
Sweet corn - 2.2 L/ac (5.5 L/ha)

**Cost:** \$8/L

**Water Volume:** 40 L/ac (100 L/ha)

**Incorporation:** Within minutes of application. Use power-driven cultivation equipment, set to cut 5-7.5 cm deep or discs set 10-15 cm - both these types of equipment should operate at 6.5-9.5 km/h. A second working, at right angles to the first will provide adequate mixing.

**Pressure:** 275 kPa

**Ground Speed:** 9 km/h

**Nozzles:** Standard nozzle delivering 40 L/ac

8. SPRAYING TIPS: Proper soil coverage and immediate and adequate soil mixing are important.
9. HOW IT WORKS: Absorbed by roots and shoots of a germinating weed, disrupts and stops growth and causes eventual death.
10. EXPECTED RESULTS:  
  
Weeds: Affected weeds do not emerge, chlorotic and bleached shoots are visible by removing a layer of treated soil.  
Crops: Weak seedlings may be injured.  
Conditions under which poor results may be expected: Conditions, such as wet, cloddy soils, not suitable for proper application or incorporation.
11. EFFECTS OF RAINFALL: Very soluble therefore, excessive moisture may cause leaching.
12. MOVEMENT IN SOIL: Will move readily.
13. GRAZING AND CROPPING RESTRICTIONS: No restrictions on grazing, crop use after hail nor on succeeding crops. Danger from drift is low.  
Caution: Excessive incorporation required may cause erosion on some soil.
14. TOXICITY: Very low acute mammalian toxicity. LD<sub>50</sub> - rats - 1600 mg/kg.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). Use standard first aid measures (see page 3) to clean skin and eyes.  
If swallowed - do not induce vomiting, get medical attention immediately.
16. STORAGE: Heated storage not required.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**ERAMOX (atrazine + simazine)**  
Ciba-Geigy

1. FORMULATIONS: Wettable powder - 40% atrazine + 40% simazine - 25 kg packs
2. REGISTERED MIXES: None
3. CROPS: Total weed control and bare ground maintenance on non-crop land.
4. WEEDS CONTROLLED: Most growth. Milkweed and horsetail require more than one treatment.
5. WEEDS SUPPRESSED: Not applicable.
6. WHEN USED: April and May OR August to freeze-up  
NOTE: Spring applications should be extended for a further month only if rainfall and soil moisture are plentiful, and top kill chemical is used.
7. HOW TO APPLY:  
**With:** Ground or small hand equipment.  
**Rate:** 5.75-11.5 kg/ac (14.2-28.4 kg/ha)  
**Cost:** \$9/kg  
**Water Volume:**  
**Incorporation:** See "Soil Sterilants" page 4.  
**Pressure:**  
**Ground Speed:**  
8. SPRAYING TIPS: See Soil Sterilants page 4.  
9. HOW IT WORKS: Eramox is a formulation of two triazines that are taken up mainly by roots but may also be absorbed through foliage.  
10. EXPECTED RESULTS: Weeds either do not emerge or die back soon after emergence.  
11. EFFECTS OF RAINFALL: Average rainfall enhances performance. Very heavy rainfall on sandy soils can lead chemical from target area and a decrease in efficacy.  
12. MOVEMENT IN SOIL: Low solubility, and low leachability, but there may be some physical movement on sloping ground.  
13. GRAZING AND CROPPING RESTRICTIONS: Not applicable.  
14. TOXICITY: Very low acute mammalian toxicity - 80 W atrazine - oral LD<sub>50</sub> (rats) - 3000 mg/kg - 80 W simazine - oral LD<sub>50</sub> (rats) 5000 mg/kg. May cause dermatitis after prolonged exposure. Non toxic to fish and birds, but it may be toxic to bees. Do not spray on foraging bees.  
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) to prevent exposure. Use standard first aid measures (see page 3) to clean skin and eyes. Induce vomiting if swallowed. Get medical attention.  
16. STORAGE: Store in dry area, heating not required.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**ESTAPROP (2,4-D + dichlorprop)**  
May and Baker

1. FORMULATIONS: Emulsifiable concentrate - 2,4-D - 300 g/L + dichlorprop - 300 g/L - 20 L pails.
2. REGISTERED MIXES: None.
3. CROPS: Spring wheat (8.2), winter wheat (9.0), barley (8.1). Underseeding - to legumes not recommended.
4. WEEDS CONTROLLED: Annual smartweeds (7.8), annual sow thistle, bluebur (9), cocklebur, flixweed, kochia (7.5), lamb's quarters (7.8), ball, dog, hare's-ear, Indian, tumble, wild, wormseed mustard (8.6), oak-leaved goosefoot, ragweed, redroot and Russian pigweed, Russian thistle, shepherd's-purse, stinkweed (9.0), stork's-bill (6.9), tartary and wild buckwheat (7.4).
5. WEEDS SUPPRESSED: Canada thistle (5.6), curled dock, perennial sow thistle.
6. WHEN USED: Spring seeded crops - 4 leaf to flagleaf. Fall seeded crops - full tillering to flag leaf.
7. HOW TO APPLY:  
**With:** No special equipment specified.  
**Rate:** 710 mL/ac (1.75 L/ha)  
**Cost:** \$6/L  
**Water Volume:** 20-80 L/ac (50-200 L/ha)  
**Pressure:** 275 kPa  
**Nozzles:** 20-80 L/ac (50-200 L/ha) nozzles
8. SPRAYING TIPS: None specified.
9. HOW IT WORKS: A systemic herbicide absorbed by leaf and stem.
10. EXPECTED RESULTS: Twisting and curling of weeds will commence 2-10 days after application. Growth ceases, eventually plants turn brown and die.  
Conditions under which poor results may be expected:  
1. Poor coverage.  
2. Low relative humidity during and after spraying.
11. EFFECTS OF RAINFALL: No information available.
12. MOVEMENT IN SOIL: Not applicable.
13. GRAZING AND CROPPING RESTRICTIONS: Drift over susceptible crops will cause injury. No grazing until 14 days after application.
14. TOXICITY: Contains no harmful dioxin - slightly high acute mammalian toxicity - oral LD<sub>50</sub> (mice) - 400 mg/kg. May be toxic to bees - do not spray on foraging bees.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) use standard first aid measures (see page 3) to clean skin and eyes. If swallowed, do not induce vomiting - see a doctor.
16. STORAGE: May be stored at any temperature. Shake well after storing for one year or longer.

## PRACTICAL USE CONSIDERATIONS

The earlier the leaf stage that stork's-bill is sprayed with Estaprop, the better the control.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**FUSILADE (fluazifop-butyl)**  
Chipman

1. FORMULATIONS: Emulsifiable concentrate - 250 g/L, 8 L.
2. REGISTERED MIXES: Fusilade + 2,4-DB Fusilade + metribuzin (Lexone, Sencor)
3. CROPS: Flax (8.4), sugar beets (8.9), sunflowers (9.0), alfalfa\*, red clover\*, bird's-foot trefoil\*, potatoes.  
\* Do not graze or harvest for feed in year of treatment.
4. WEEDS CONTROLLED: Corn, barnyard grass (7.5), Johnson grass, Persian darnel (6.8), wheat (9.0), barley (6.2), wild oats (7.5), wild proso millet, crabgrass, yellow and green foxtail (7.0), quackgrass (6.4).
5. WEEDS SUPPRESSED: At lower rate, yellow and green foxtail.
6. WHEN USED: 2-6 leaf stage of corn, barnyard grass, Persian darnel, wheat, barley, wild oats, wild proso millet, 2-4 leaf stage of yellow and green foxtail; 3-5 leaf stage of actively growing quackgrass.
7. HOW TO APPLY:

**With:** Ground equipment

**Rate:** Corn: 240 mL/ac (600 mL/ha).  
Barnyard grass, Johnson grass, Persian darnel, barley, wheat: 320 mL/ac (800 mL/ha)  
Wild oats, wild proso millet, crabgrass 400 mL/ac (1.0 L/ha).  
Green and yellow foxtail suppression: 400 mL/ac (1.0 L/ha) - 570 mL/ac (1.4 L/ha).  
Quackgrass (tilled land): 10 mL/ac (2.0 L/ha).  
(non-tilled land): 1.2-1.6 L/ac (3.0-4.0 L/ha).

**Cost:** \$37/L

**Water Volume:** 40-120 L/ac (100-300 L/ha)

**Pressure:** 200-300 kPa

**Ground Speed:** Sufficient to ensure complete coverage.

**Nozzles:** Standard flat fan nozzles.

8. SPRAYING TIPS:
  - (a) Less effective when plants are stressed by lack of moisture, low temperature and/or very low relative humidity.
  - (b) Apply 3 days before the use of any broadleaf herbicide.
  - (c) Rhizomes of quackgrass should be thoroughly fragmented by tillage prior to application to obtain control at the lower rate.
  - (d) Do not cultivate for five days after applying.
  - (e) Add Agral R 90 at the rate of 1 L for every 1,000 L of spray solution (0.1% by volume). Do not add Agral 90 when tank mixed with other herbicides.
9. HOW IT WORKS: Systemic readily translocated.
10. EXPECTED RESULTS: Weeds will cease growth, but death takes several weeks.
11. EFFECTS OF RAINFALL: No effect two hours after application.
12. MOVEMENT IN SOIL: Not applicable.
13. GRAZING AND CROPPING RESTRICTIONS: Do not harvest alfalfa, red clover, and bird's-foot trefoil for feed or graze livestock in the year of treatment.
14. TOXICITY: Very low acute mammalian toxicity, oral LD<sub>50</sub> - rats = 4770 mg/kg. May cause skin and eye irritation.
15. PRECAUTIONS, FIRST AID: Wear standard protective gear (see page 2) plus goggles. Use standard first aid measures (see page 3) to clean skin and eyes.
16. STORAGE: Not affected by freezing.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**GLEAN (chlorsulfuron)**  
Dupont

1. FORMULATIONS: Dry Flowable 75%; 500 g container.
2. REGISTERED MIXES: Glean + Avenge 200C (wheat, barley); Glean + Surfactant; Glean + Roundup.
3. CROPS: Wheat (spring, durum, winter) (9.0), barley (9.0), oats. Spring application on winter wheat.
4. WEEDS CONTROLLED: Annual smartweeds (8.3), common chickweed (8.6), cleavers (8.2), cow cockle (9.0), hemp-nettle (8.3), lamb's quarters (7.1), redroot pigweed (8.5), Russian thistle (6.2), stinkweed (8.2), volunteer rapeseed (8.1), wild buckwheat (7.7), wild mustard (8.0), flixweed, kochia.
5. WEEDS SUPPRESSED: Canada thistle (6.6)
6. WHEN USED: Wheat (spring, durum), barley, oats - 2 leaf to flag leaf (shot blade) stage. Winter wheat - from the time the crop emerges to the flag leaf (shot blade) stage. **Brown and dark brown soils:** post harvest prior to planting spring wheat (except Durum); Chemical fallow (preceding wheat) - post harvest prior to fallow or in spring during fallow. Glean + Roundup (preceding wheat).
7. HOW TO APPLY:

**With:** Ground equipment

**Rate:** 6-12 g/ac (15-30 g/ha) [When tank mixed with Avenge 200C add 1.7 L/ac (4.25 L/ha) of Avenge 200C to the chosen rate of Glean. Do not add surfactant.] Fall - 8-12 g/ac (20-30 g/ha). Fallow - 12 g/ac (30 g/ha). Glean + Roundup - 12 g/ac + 0.3-0.4 L/ac (30 g/ha + 0.75 - 1 L/ha).

**Cost:** \$350/500 g

**Water Volume:** 25 L/ac (60 L/ha) (minimum)

**Pressure:** 275 kPa

**Nozzles:** Flat fan types. Increased water volumes are required for flood jet or "Raindrop" nozzles.

**Surfactant:** Use 100 ml/100 L spray mixture of Agsurf, Agral 90, or Citowett Plus.

8. SPRAYING TIPS: Use metal filters only. Filters and screens 50 mesh or larger. Higher spray volumes required for dense crop canopy and/or large weeds. Continuous agitation is required. Effectiveness may be reduced if spray mixture remains in tank for more than 24 hours. Do not exceed a total of 12 g/ac (30 g/ha) within a 12 month period. **Ensure that Glean is completely suspended before mixing Roundup.**

9. HOW IT WORKS: Absorbed by foliage and roots. Inhibits cell division.

10. EXPECTED RESULTS: Weeds: Weed growth stops almost immediately. After 7-10 days yellowing or purpling will occur followed by complete desiccation. "Glean" remains active in the soil throughout the growing season controlling later germinating weeds. Poor results may be expected with improper mixing, timing, coverage or when weeds are under drought stress.

11. EFFECTS OF RAINFALL: Heavy rainfall immediately after application may cause temporary lightening of crop.

12. MOVEMENT IN SOIL: Movement is restricted by fine textured soils, soil organic matter and neutral to acidic conditions.

13. GRAZING AND CROPPING RESTRICTIONS:

**Drift:** Extreme care must be taken to prevent drift onto desirable plants or non-target agricultural land. **Succeeding Crops:** Glean may only be used on land with a pH of 7.5 or lower and dedicated exclusively to the production of wheat and/or barley for at least the next two years.

**Recropping:** On soils with a pH of 7.0 or lower, wheat or barley may be seeded the following season (10 months). On soils with a pH of 7.1 to 7.5 **only** wheat may be seeded the following season (10 months). On soils with pH 7.1 to 7.5 barley may be seeded the second season (22 months). Recropping to peas or canola in Black Soil Zones, where pH is less than 7.0 and organic matter content is greater than 5% is possible after 3 seasons (34 months). If rainfall in any one season is less than 250 mm, extend this interval by one year.

**Note:** 1. A field bioassay is required one year before sowing any other crop.  
2. All cropping restrictions which apply to Glean alone will apply to the Avenge 200C + Glean tank mix.  
3. To avoid injury to crops susceptible to Glean, thoroughly clean sprayer immediately after spraying.  
— Canola is sensitive to very small traces of Glean.  
(1) Drain tank, flush tank, boom and hoses with clean water for a minimum of 10 minutes.  
(2) Fill the tank with clean water, add ½ litre chlorine bleach (containing 5.25% to 6.0% sodium hypochlorite) per 100 litres of water.  
Flush through boom and hoses, allow to sit for 15 minutes with agitation, drain.  
(3) Repeat step 2.  
(4) Nozzles and screens should be removed and cleaned separately. To remove traces of chlorine bleach, rinse the tank thoroughly with clean water and flush through hoses and boom.

**Note:** Do NOT use chlorine bleach with ammonia. All traces of liquid fertilizer containing ammonia or ammonium nitrate or ammonium sulphate must be removed from the application equipment before adding chlorine bleach solution. This can be done effectively by rinsing with water. Failure to do so will result in a release of a gas with a musty chlorine odor which can cause eye, nose, throat and lung irritation. Do NOT clean equipment in an enclosed area.

**Grazing restrictions:** None.
14. TOXICITY: Low acute mammalian toxicity, oral LD<sub>50</sub> - rats = 5919 mg/kg.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). Use standard first aid measures (see page 3) to clean skin and eyes.
16. STORAGE: Store in a cool, dry place.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**GRAMOXONE (paraquat)**  
Chipman Inc.

1. FORMULATIONS: Solution 200 g/L - 1 and 5 L containers.
2. REGISTERED MIXES: None. Mix restrictions: Not applicable
3. CROPS: Shelterbelts, stale seedbed for vegetables and field crops, potatoes, sugar beets, non-crop land, and chemical mowing.
4. WEEDS CONTROLLED: All top growth, repeat applications may be necessary on perennial weeds. Annual weeds generally killed with one application.
5. WEEDS SUPPRESSED: Most perennial weeds.
6. WHEN USED: Prior to crop emergence, but soon after weeds emerge.
7. HOW TO APPLY:

**With:** Ground equipment only.

**Rate:** *Grass and Weed Control in Shelterbelts:* Apply 2.2 L Gramoxone in 440 L of water/ac (5.5 L Gramoxone in 1,000 L of water/ha) or 75 mL in 10 L of water/100 m<sup>2</sup>. 550 mL of this mixture will treat an area 1.75 m in diameter around a tree.

*Stale Bed Technique for Vegetable & Field Crops:* Pre-emergent to crop, post-emergent to weeds: For weed control in beans (all types), beets, carrots, cole crops, corn, cucumbers, onions, peas, potatoes, soybeans, and turnips, prepare a seedbed at least 2-4 weeks before seeding to stimulate weed growth. Seed with a minimum disturbance of the soil. To burn off emerged weeds apply 1-2 L Gramoxone in 120-440 L of water/ac (2.75-5.5 L Gramoxone in 300-1,000 L/ha) prior to or after seeding. Do not apply later than 3 days before crop emergence. Use 2.0 L/ac (5.5 L/ha) when weeds are above 5 cm in height, and higher volumes of water on dense weed growth.

*Potatoes:* Apply up to ground crack only for Netted Gem and Cherokee. For other varieties apply up to the time the first potato tops have reached 5-8 cm. Apply 1-1.75 L in 120-200 L of water/ac (2.7-4.2 L in 300-500 L/ha) for control of quackgrass, annual grasses and broad-leaf weeds. To control emerged seedling grasses and broad-leaf weeds use only 610 mL of Gramoxone in 120-220 L of clean water/ac (1.5 L of Gramoxone in 300-550 L/ha).

**NOTE:** Application to exposed or emerged potato foliage will cause temporary injury and chlorosis. Do not apply to emerged potato foliage in the evening, or when potatoes are under moisture stress due to extremely dry soil conditions, or to early potatoes. The use of poor or diseased seed and cut seed with one eye will make potatoes more susceptible to injury by post-emergence Gramoxone sprays. This treatment will eliminate several cultivations, but has no residual action and will not control weeds that germinate after treatment.

*Weed Control in Non-Crop Land:* Rapid top kill of weeds and grasses as a foilar spray. Apply 2-4 L of Gramoxone in 220-440 L/ac (5.5-11 L in 500-1,100 L of water/ha) thoroughly wetting all foliage.

*Chemical Mowing:* For rapid scorch of weeds and grasses, apply 1.0 L in 220-440 L of water/ac (2.75 L in 550-1,100 L of water/ha), thoroughly wetting all foliage.

*For Weed Control in Non-Crop Land and Chemical Mowing:* Gramoxone may be tank mixe with certain soil sterilants where immediate top kill and long-term sterilization are required.

**Cost:** \$14/L

**Water Volume:** Thoroughly wet all foliage. For dense weed growth use the higher volume of water.

**Incorporation:** Not applicable

**Pressure:** 300 kPa

**Ground Speed:** 9 km/h

**Nozzles:** All standard nozzles delivering the required volume.

8. SPRAYING TIPS: Use high volume, low pressure type spraying equipment to thoroughly cover the foliage. Special equipment is necessary for use on some row crops to shield the crops from the spray. Applications made on cloudy days, during dull sunlight or just prior to or during periods of darkness will generally increase the effectiveness of the treatment. Do not apply with mist blowers. It is important to thoroughly wash equipment after spraying - use a wetting agent (Agral 90 at 60 mL/100 L of water), flush and spray out, then thoroughly rinse with clean water. When possible, the equipment should be filled with clean water and left overnight. Spray out before storing equipment or using other materials. Use only clean water to avoid reduction in effectiveness.
9. HOW IT WORKS: Gramoxone is absorbed by leaves and stems, but does not translocate.
10. EXPECTED RESULTS: Weeds: Gramoxone provides immediate, fast and virtually complete annual weed kill from one application. Repeat applications may be necessary for perennial weeds. Yellowing occurs within a few hours and desiccation of the plant continues rapidly until death. Gramoxone is inactivated on contact with the soil, it has no residual effect. Rain prior to the spray solution drying on plant or muddy water will reduce the effectiveness of the chemical.
11. EFFECTS OF RAINFALL: Once the spray solution has dried on the plant tissue, rain will not reduce the effectiveness of Gramoxone.
12. MOVEMENT IN SOIL: Gramoxone binds to the soil and becomes biologically unavailable.
13. GRAZING AND CROPPING RESTRICTIONS: *Drift:* Avoid application or drift onto crops, ornamental plants, lawns, grazing areas or other desirable growth. *Grazing Restrictions:* Not applicable. *Crop Use After Hail:* No restriction. *Succeeding Crops:* No restriction
14. TOXICITY: Very high acute mammalian toxicity. Oral LD<sub>50</sub> rats = 120 mg/kg. Symptoms of acute poisoning may occur. Long term inhalation exposure to Gramoxone may cause irreversible lung damage.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) goggles and respirator when working with Gramoxone. Use standard first aid measures immediately (see page 3) if in contact with skin or eyes. If swallowed, induce vomiting and see a doctor immediately.
16. STORAGE: Heated storage preferred. Will crystallize if frozen.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**HERBEC 20P (tebuthiuron)**  
Elanco

1. FORMULATIONS: 20% Pellets - 20 kg bag
2. REGISTERED MIXES: None registered.  
Mix restrictions: Not applicable.  
Mixing with other pesticides: Not recommended.
3. CROPS: Industrial brush control.
4. WEEDS CONTROLLED: Alder, balsam fir, birch, pine, poplar, spruce (black, white), tamarack, willows.
5. WEEDS SUPPRESSED: Not applicable.
6. WHEN USED: Herbec 20P may be applied any time the ground is not frozen or snow-covered. Summer and fall applications will control brush the following year.
7. HOW TO APPLY:  
**With:** Air or ground granular applicator  
**Rate:** 6.9-8.9 kg/ac (17-22 kg/ha)
8. SPRAYING TIPS: See Soil Sterilants page 3. The granular applicator must be properly calibrated to ensure uniform distribution.
9. HOW IT WORKS: Absorbed by roots. Applied to the soil surface it is moved slowly into the soil by rainfall. The rate of movement depends upon soil-type, amount of rainfall. Shallow-rooted species will be killed more quickly than deep-rooted species.
10. EXPECTED RESULTS: Product applied in the summer and fall of one year will start to control brush later in the following year. Some species may undergo repeated defoliation and complete kill may come as late as 24 to 36 months after application. Since the number of pellets/ac is very low, the effect on ground cover is minimal. Application onto frozen ground may give poor results.
11. EFFECTS OF RAINFALL: Increased rainfall will increase the speed at which this product kills brush.
12. MOVEMENT IN THE SOIL: To be effective Herbec 20P must be leached into the root zone of the brush. Movement in the soil is vertical and not lateral. Depth of leaching rarely goes beyond 18 inches (45 cm).
13. GRAZING AND CROPPING RESTRICTIONS:  
Grazing Restrictions: Do not graze treated area.  
Succeeding Crops: An industrial brush control for use on noncrop land.
14. TOXICITY: Slightly high toxicity to mammals. Oral LD<sub>50</sub> - rats - 644 mg/kg. Not toxic to cattle - slightly toxic to birds and fish.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2.) Use regular first aid measures (see page 3) to clean skin and eyes.
16. STORAGE: Store in a dry area.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**HERITAGE (trifluralin)**  
Elanco

**Wheat - Brown Soil Zones Only**

1. FORMULATIONS: Granular 5%; 25 kg bag.
2. REGISTERED MIXES: None
3. CROPS: Wheat (spring, durum) (8.6). Underseeding: Not recommended.
4. WEEDS CONTROLLED: *Fallow Year:* Green foxtail (8.1), wild oats (7.5), Persian darnel, barnyard grass (8.3), wild buckwheat (8.3), cow cockle (9.0), lamb's-quarters (8.0), redroot pigweed (8.2) and Russian thistle (7.9). *Crop Year:* Green foxtail and lamb's-quarters.
5. WEEDS SUPPRESSED: Crop Year: Wild buckwheat.
6. WHEN USED: Apply to summerfallow fields between May 15 and August 15 for weed control during both years of the summerfallow-wheat rotation. The maximum benefit comes when applied as early as possible in the fallow year.
7. HOW TO APPLY:

**With:** Ground equipment with granular applicator.

**Rate:** May 8.9 kg/ac (22 kg/ha), June 7.7 kg/ac (19 kg/ha), July 6.5 kg/ac (16 kg/ha). Brown Soil Zones Only.

**Cost:** \$1.50/kg

**Incorporation:** Can be applied over standing stubble or preworked stubble provided the straw is chopped and evenly distributed over the soil surface. If green growth prevents proper mixing, it must be destroyed before application. Incorporate within 24 hours of application to a depth of 5-8 cm with a field cultivator, a deep tillage cultivator or a disc. Cultivators should be operated at 10-13 km/h and discs at 7-10 km/h. The second operation to a depth of 5-8 cm must be done at right angles to the first and may be done whenever necessary to control resistant weed growth in the fallow year. Additional operations with a rodweeder or shallow tillage cultivator may be required to control resistant weed growth. Do not blend with a cultivator when the soil is crusted, lumpy or too wet for good mixing action. Blending with implements set to cut deeper than 8 cm can result in erratic weed control and crop injury.

8. SPRAYING TIPS: Prior to fall application, spread straw evenly over the field surface and leave stubble standing over winter to trap snow. The straw must be spread uniformly enough so as not to interfere with the mixing of Heritage into the soil the next spring.

If green growth interferes with soil mixing, it must be destroyed by tillage or a recommended herbicide before application in the spring. Do not apply on soils subject to prolonged periods of flooding. Do not apply to wet soil, soils in poor working condition or soils with more than 8% organic matter. Maximum benefit occurs when Heritage is applied soon after May 15.

In the crop year, after application, seedbed preparation should be done with a field cultivator set to cut 5 cm deep when the soil is warm enough to promote good germination. Seed into a weed-free seedbed using a double disc or hoe drill set to seed 4-8 cm deep. If a discer or air seeder is used, a separate spring tillage may not be necessary. The seed should be placed 5-8 cm deep and the soil should be packed or harrowed after seeding.

Drought conditions in the fallow year prior to seeding may result in higher levels of Heritage in the soil when the crop is seeded. To reduce the possibility of injury in this situation, seed the crop 4-8 cm deep into a moist, warm seedbed.

9. HOW IT WORKS: Heritage kills seedlings as they germinate by inhibiting cell division at the actively growing points in the roots and shoot. Affected weeds have puffy, brittle, slow growing shoots. The lateral and secondary roots of affected seedlings are stunted and swollen at the tip, and are brittle. The roots of affected plants show increased diameter near the tips and lateral and secondary root development is halted. Weeds die due to severe damage to the root system.
10. EXPECTED RESULTS: After the first incorporation, susceptible weeds will only be partially controlled. After the second operation, susceptible weeds will be controlled before they emerge.  
Crop: Wheat grown in rotation after summerfallow will not be injured. However, over-application may result in reduced crop stand, delayed development or reduced yields.
14. TOXICITY: Has very low acute mammalian toxicity; oral LD<sub>50</sub> rats = 10,000 mg/kg. Non-toxic to bees; very toxic to fish. Under runoff conditions or in muddy water, the suspended soil binds Heritage very strongly and large amounts of Heritage can be tolerated by fish.
15. PRECAUTIONS AND FIRST AID: Wear standard protective clothing (see page 2) to reduce exposure. Use standard first aid measures (see page 3) to clean skin and eyes. If swallowed induce vomiting, see a doctor.
16. STORAGE: Store herbicide bags in areas not exposed to high temperatures, prolonged direct sunlight or moisture. Do not let product remain in the granular applicators under those conditions. After filling the granular applicator, close the lid immediately to avoid prolonged exposure to direct sunlight.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

## HOE-GRASS II (diclofop-methyl/bromoxynil)

Hoechst

1. FORMULATIONS: Emulsifiable concentrate 230 g/L diclofop-methyl + 80 g/L bromoxynil - 20 L.
2. REGISTERED MIXES: Mixing with any pesticide, fertilizer, or chemical additive is **not** recommended.
3. CROPS: Wheat (spring (8.7), durum), barley (8.4) (do not apply to 2-row varieties), flax (7.6). Do not treat crops underseeded to legumes.
4. WEEDS CONTROLLED: Wild oats (7.4), yellow and green foxtail (7.4), barnyard grass (9.0), persian darnel (2.0), volunteer corn (8.4), wild buckwheat (8.0), Tartary buckwheat (7.2), lady's thumb, green smartweed (8.8), kochia (8.2), common groundsel (9.0), knawel, night flowering catchfly (8.8), cow cockle (7.9), wild mustard (8.3), scentless chamomile (8.7), stinkweed (8.2), lamb's-quarters (8.6), redroot pigweed (8.8), Russian thistle (8.9).
5. WEEDS SUPPRESSED: None
6. WHEN USED: 1-4 leaf stage of wild oats, green and yellow foxtail, and barnyard grass. 1-3 leaf stage of persian darnel and a height of 15-25 cm for volunteer corn. Broadleaved weeds are controlled from seedling to early 4 leaf stage (except for Russian thistle where the stage is seedling to 5 cm in height). Flax 5-10 cm in height.
7. HOW TO APPLY:

**With:** Ground equipment only. Do not apply by air.

**Rate:** 1.4 L/ac (3.5 L/ha).

**Cost:** \$13/L

**Water Volume:** 45 L/ac (110 L/ha)

**Pressure:** 275 kPa.

**Ground Speed:** 6-8 km/h

**Nozzles:** Use 80° stainless steel flat fan nozzles. Do not use flood jet type nozzles or controlled droplet application equipment.
8. SPRAYING TIPS:
  - (a) Nozzles should be tilted 45° forward to ensure better coverage.
  - (b) For best results and maximum yield enhancement, apply when majority of weeds are in the 2-3 leaf stage.
  - (c) During periods of stress (heat, drought or low humidity) reduced weed control may result.
  - (d) Hoe-Grass II must be applied at least 4 days before the use of any other herbicide to eliminate a reduction of control.
9. HOW IT WORKS: Diclofop-methyl possesses contact as well as systemic action. Uptake is primarily through the leaves. The site of action is the growing point. Bromoxynil is primarily a contact herbicide with limited translocation in susceptible annual broadleaved weeds.
10. EXPECTED RESULTS: Yellowing of susceptible plants are visible within 2-4 days. New leaf growth exhibits light chlorosis which deepens and browning develops within 10-14 days of application. Photosynthesis and growth are inhibited and uptake of water and nutrients ceases. Lack of adequate crown root development is one of the most distinguishable features of diclofop-methyl activity.

Bromoxynil activity is evident within 24 hours as necrotic spots appear on the leaves of susceptible broadleaved weeds. This damage spreads rapidly until the plants ultimately die. Chlorosis may develop in the untreated leaves of these susceptible weeds even though very little movement of the bromoxynil occurs. **Precautions:** **Barley** - Hoe-Grass II must be applied in the 1-4 leaf stage of the barley and prior to tillering. Application beyond the 4 leaf stage or after tillering will result in crop damage. Under certain environmental conditions, yellow blotches may appear on the barley leaves. These blotches will be rapidly outgrown and will not affect maturity or yield. DO NOT APPLY TO TWO-ROW BARLEY VARIETIES IN ALBERTA.

**Flax** - Hoe-Grass II must be applied when the flax is 5-10 cm in height. Do not spray flax. During periods of heat or humidity stress, it may cause leaf burn, retarded growth and a slight maturity delay.
11. EFFECTS OF RAINFALL: Rainfall within one hour will decrease activity.
12. MOVEMENT IN SOIL: Some movement may occur if sufficient moisture is present.
13. GRAZING AND CROPPING RESTRICTIONS: *Drift:* Avoid treatment near susceptible crops. *Grazing Restrictions:* Do not graze treated field prior to harvest. Do not use treated field for green forage. Do not apply Hoe-Grass II within 60 days of harvest. *Succeeding Crops:* No restriction.
14. TOXICITY: Has very low toxicity; acute oral LD<sub>50</sub> rats = 2,350 mg/kg. Toxic to fish; eye irritant.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) plus goggles to reduce eye exposure. Use standard first aid measures (see page 3) to clean skin and eyes. If swallowed, **do not induce vomiting** but rush person to nearest hospital.
16. STORAGE: Do not store below freezing. If stored for one year or longer, shake well before using.

### PRACTICAL USE CONSIDERATIONS

1. Due to the reduced solvents and emulsifiers, the formulated mix of Hoe-Grass II damages barley less than the tank-mix of Hoe Grass plus Torch/Pardner.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**HOE-GRASS 284 (dichlofop-methyl)**  
Hoechst

1. FORMULATIONS: Emulsifiable concentrate - 284 g/L - 20 L pack.
2. REGISTERED MIXES: Hoe-Grass 284 + Torch, Torch DS, Pardner.  
Mixing with other pesticides -- not recommended.
3. CROPS: Wheat (winter, durum) (9.0), spring wheat (8.5), barley (except Klages, Betzes, Norbert, Corona) (8.2), flax (8.9), rapeseed (8.9), peas (field, canning) (9.0), lentils (8.4), tame buckwheat (8.1), spring rye (8.7), fall rye (9.0), tame mustard (8.9), triticale (8.8), dry common beans (8.8), fababeans (9.0), soybeans (8.8), sunflowers (8.4), potatoes (8.7), onions (drybulb) (8.6) and the following perennials: grasses and legumes grown for seed, in the year of establishment - alfalfa (9.0), crested wheatgrass (8.2), Russian wild ryegrass (7.6) and creeping red fescue (8.8).
4. WEEDS CONTROLLED: Wild oats (7.7), foxtail (green, yellow) (7.6), barnyard grass (8.0), Persian darnel (7.0).
5. WEEDS SUPPRESSED: None
6. WHEN USED: 1-5 leaf stage of wild oats, 1-4 leaf stage of green and yellow foxtail, and barnyard grass. 1-3 leaf stage of persian darnel and a height of 15-25 cm for volunteer corn. Apply to barley in the 1-4 leaf stage and prior to tillering.
7. HOW TO APPLY:

**With:** Ground or aircraft.

**Rate:** 10 L/ac (2.5 L/ha). For control of wild oats in the 4-5 leaf stage, apply at 1.13 L/ac (2.8 L/ha). When tank mixing with bromoxynil, use 1.1 L/ac (2.8 L/ha).

**Cost:** \$15/L

**Water Volume:** Aircraft - minimum of 15 L/ac (35 L/ha)  
Ground - 40 L/ac (100 L/ha)

**Pressure:** Aircraft - 300 kPa, ground - 275 kPa

**Ground Speed:** 9 km/h

**Nozzles:** Ground - use of 80° stainless steel flat fan nozzles optimum spray coverage. Do not use flood jet nozzles.
8. SPRAYING TIPS: Nozzles should be tilted 45° forward to ensure better coverage. When tank mixing with bromoxynil do not delay Hoe-Grass 284 application if grassy weed is in correct stage. Reduced control if Hoe-Grass 284 is applied to weeds growing under stress. Control may be further reduced if tank mixed. Apply at least 4 days before any broadleaf herbicide, except bromoxynil products, to eliminate a reduced grass kill from Hoe-Grass 284. Do use Controlled Droplet Application equipment.
9. HOW IT WORKS: Contact as well as systemic action. Uptake primarily through the leaves and translocated to growing point. Penetration and uptake via roots may occur if the soil is sufficiently moist and the rate of application is relatively high.
10. EXPECTED RESULTS: Yellowing of susceptible plants is noticeable within 2-4 days of application. New leaf growth exhibits light chlorosis which deepens and browning develops 10-14 days after application. Photosynthesis and growth are inhibited and uptake of water and nutrients ceases. Lack of adequate crown root development is evident on wild oats as well as in some sensitive barley varieties.
11. EFFECTS OF RAINFALL: Rainfall within one hour will decrease activity.
12. MOVEMENT IN SOIL: Some movement in soil if sufficient moisture is present.
13. GRAZING AND CROPPING RESTRICTIONS:

*Drift:* Danger from drift is low.

*Grazing Restrictions:* Do not graze treated green crop.

*Succeeding Crops:* No restriction.
14. TOXICITY: Very low acute mammalian toxicity - oral LD<sub>50</sub> - rats = 2140 mg/kg toxic to fish, non-toxic to birds.
15. PRECAUTIONS, FIRST AID: Wear standard protective gear (see page 2). Use standard first aid measures (see page 3) to clean skin and eyes. If swallowed, do not induce vomiting - get medical attention immediately.
16. STORAGE: Do not store below freezing. If stored one year or longer, shake well before using.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**HYVAR X (bromacil)**  
DuPont

1. FORMULATIONS: 80% wettable powder - 25 kg, 2 kg packs. Water soluble liquid: 240 g/L (Hyvar X L) - 4 L, 10 L packs.
2. REGISTERED MIXES: None
3. CROPS: Non-crop land only. Total vegetation control.
4. WEEDS CONTROLLED: Hyvar X is a non-selective, total vegetation control chemical for weeds, grasses and some brush as: alder, aspen and balsam poplar, ash.
5. WEEDS SUPPRESSED: Not applicable
6. WHEN USED: See Soil Sterilants - page 3.
7. HOW TO APPLY:

**A) Hyvar X Liquid**

**With:** Power sprayer. Handguns, backpack sprayers or a watering can may be used to treat small areas.

**Rate:**

- (i) Initial treatment. Apply 12-18 L/ac (30-45 L/ha). Higher dosage on soils containing 5% or more organic matter, or soils high in clay content.
- (ii) Retreatment to control regrowth as alfalfa, 7-9 L/ac (17-22 L/ha).
- (iii) For small areas, apply 450 mL on 100 sq. m.
- (iv) *Brush Control*  
Spot Treatment - apply undiluted at 8 mL per 1 m of tree height up to 3 m.

Four or five 8 mL deposits around the root collar for brush taller than 3 m.

**B) Hyvar X**

Same as Hyvar X L, except more efficient agitation of the spray solution is required.

**Rate:**

- (i) Initial treatment. 3-5 kg/ac (7.71-13.5 kg/ha). Use the higher dosage on soils containing 5% or more organic matter, or soils high in clay content.
- (ii) When weeds and grasses reappear, apply 1.5-2.7 kg/ac (3.2-6.7 kg/ha).
- (iii) *Brush Control*  
Mix 870 g Hyvar X in 10 L of water and apply 30-60 mL/stem 5-10 cm in basal diameter. Wet base of stem to run off.

**Cost:** Hyvar XL - \$10/L.

**Water Volume:** For application of Hyvar X L with a handgun apply 650 L of spray solution/ac (1,600 L of spray solution/ha). For mixing of Hyvar X use a minimum of 20 L of water/kg of Hyvar X. See soil sterilants page 3.

8. SPRAYING TIPS: See soil sterilants page 3.
9. HOW IT WORKS: Hyvar X is readily absorbed through the roots but much less readily through the leaves. Once in the plant it inhibits photosynthesis. **Caution:** Do not apply closer than 1½ times the height of desirable vegetation.
10. EXPECTED RESULTS: Susceptible plants become chlorotic and then die. Vegetation kill is faster with higher rainfall. Poor results may be expected if weed growth too mature or if there is insufficient rainfall.
11. EFFECTS OF RAINFALL: Rainfall will carry the chemical into the root zone where it is absorbed.
12. MOVEMENT IN SOIL: Movement in the soil is dependent upon soil type and soil moisture. Bromacil will move faster in a vertical direction in sandy soils than in soils high in organic matter or clay content. Movement can be severe on sloping areas.
13. GRAZING AND CROPPING RESTRICTIONS: Drift: All crops and ornamentals may be injured by chemical drift. Do not apply in areas subject to severe soil erosion.
14. TOXICITY: Very low acute mammalian toxicity - oral LD<sub>50</sub> - rats = 5,200 mg/kg. Toxic to fish.
15. PRECAUTIONS AND FIRST AID: Wear standard protective clothing (see page 2) when using. Use standard first aid measures (see page 3) in case of severe exposure. If swallowed, induce vomiting - see a doctor.
16. STORAGE: Hyvar X - Store in a cool dry place. Hyvar X L - Combustible, keep away from heat or open flame. Do not allow to freeze.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**KARMEX (diuron)**  
DuPont

1. FORMULATIONS: 80% wettable powder - 2 kg, 25 kg packs.
2. REGISTERED MIXES: None
3. CROPS: Asparagus; irrigation and drainage ditches and spot treatment for general weed control. Non-crop areas.
4. WEEDS CONTROLLED: Broad leaved and grassy weed seedlings.
5. WEEDS SUPPRESSED: Not applicable
6. WHEN USED: Karmex may be used at any time, except when the ground is frozen. Sufficient rainfall or irrigation is necessary following treatment to carry the chemical to the root zone.
7. HOW TO APPLY:

**With:** Field sprayer, hand sprayer, back-pack or sprinkling can.

**Rate:**

- (i) *General Weed Control:*  
Apply 5.8-11 kg/ac (14.0-27.0 kg/ha) on sand or sandy soils. Apply 16-22 kg/ac (40.0-55.0 kg/ha) on clay or high organic soils. Use the lower rate when annual weed growth predominates and where only one season's control is desired.
- (ii) *Retreatment:*  
For regrowth begins apply 500 g/ac (1.1 kg/ha) to control seedling annuals.
- (iii) *Irrigation and Drainage Ditches*  
Apply 250-750 gm/100 sq. m. or 10-30 kg/ac (25.0-75.0 kg/ha). Apply during the non-crop season when the ditch is not in use. Flush once before using for irrigation purposes. Karmex must be fixed in the soil by moisture to minimize movement in irrigation water.
- (iv) *Spot Treatment*  
Spot treat at 0.75-1.0 kg/100 sq. m. or 31-40.5 kg/ac (75.0-100.0 kg/ha) to control couch grass and toadflax. A rate of 50 g of Karmex applied on 10 sq. m. is equal to 20.2 kg/ac (50 kg/ha).

**Cost:** \$15/kg.

**Water Volume:** Use a minimum of 20 L of water/kg of Karmex.

8. SPRAYING TIPS: See soil sterilants page 3.
9. HOW IT WORKS: Diuron is readily absorbed through the root system and less readily absorbed through stem and foliage.
10. EXPECTED RESULTS: Susceptible plants become chlorotic soon after treatment and then die. Poor control may be expected from inadequate rate or weeds too old or insufficient rainfall. Application on slopes may cause erosion. Application too near feeding roots of susceptible vegetation may cause injury.
11. EFFECTS OF RAINFALL: Rainfall will activate the chemical, carrying it into the root zone.
12. MOVEMENT IN THE SOIL: Diuron absorbs readily to the soil and there is little movement by leaching.
13. GRAZING AND CROPPING RESTRICTIONS:  
*Drift:* All crops and ornamentals may be injured by chemical drift.  
*Succeeding Crops:* Only on non-crop land.
14. TOXICITY: Very low acute toxicity to mammals - oral LD<sub>50</sub> - rats = 3,400 mg/kg. Non toxic to birds and fish. **Long-term continuous exposure may cause spleen enlargement.**
15. PRECAUTIONS, FIRST AID: Use standard protective clothing (see page 2). Use standard first aid measures (see page 3) to clean skin and eyes.
16. STORAGE: Store in a cool dry place.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**KERB 50W (propyzamide)**  
Rohm & Haas

1. FORMULATIONS: 50% Wettable Powder - 2.0 Kg bags
2. REGISTERED MIXES: None specified.
3. CROPS: Established grass, grass/legume (alfalfa, bird's-foot trefoil) pastures. First year and established alfalfa (8.7) and bird's-foot trefoil.
4. WEEDS CONTROLLED: Foxtail barley (7.5), volunteer grain, wild oats (5.9), chickweed (8.2), orchard grass (8.3), seedling quackgrass (7.4), timothy.
5. WEEDS SUPPRESSED: None.
6. WHEN USED: Fall - alfalfa, bird's foot trefoil. Spring - alfalfa seed crops.
7. HOW TO APPLY:

**With:** Ground equipment only.

**Rate:** Pastures: 360 g/ac (900 g/ha) on brown, dark brown, gray wooded soils. 450 g/ac (1.1 kg/ha) on thin black and black soils. First year and established legumes: 710 g/ac (1.75 kg/ha). Fall or spring controls annual grasses as volunteer cereals or wild oats 910 g - 1.3 kg/ac (2.2-3.2 kg/ha). Fall only - controls quackgrass, orchard grass, timothy, chickweed.

**Cost:** \$39/kg

**Water volume:** 40-200 L/ac (100 - 500 L/ha)

**Incorporation:** None. Spring application on alfalfa seed crops - if soil temperature is high and moisture low - a light incorporation is suggested.

**Pressure:** 275 kPa.

**Ground Speed:** 8 km/h.

**Nozzles:** Flat fan.

8. SPRAYING TIPS:

**Fall Application** - when soil temperature is low but above freezing and soil moisture high. Rain in a day or two or light overhead irrigation (1.25-2.5 cm) improves results.

**Spring Application** - Best when soil temperature is cool. Do not use on high organic matter, peat or muck soils. Spray overlaps may seriously injure desirable grass. Apply between October 1 and freeze up. Do not use on Timothy, Fescue or perennial blue grass. Do not use in seed grass stands. Use 50 mesh or larger metal filters and nozzle screens. Best results when soil temperature is low but above freezing and soil moisture high.

9. HOW IT WORKS: Root absorption. Inhibits cell division.

10. EXPECTED RESULTS: Plant growth stops, turns brown and dies.

11. EFFECT OF RAINFALL: Improves efficacy.

12. MOVEMENT IN SOIL: Very little leaching. Readily absorbed on organic matter.

13. GRAZING AND CROPPING RESTRICTIONS: Do not harvest or graze within 90 days of applying 1.3 kg/ac (3.2 kg/ha) or 60 days after lower rates. Wait 9 months before planting other crops.

14. TOXICITY: Very low acute mammalian toxicity; Oral LD<sub>50</sub> rats = 8,350 mg/kg.

15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) to avoid exposure. Use standard first aid measures (see page 3) to clean contaminated skin and eyes. If swallowed, induce vomiting. Get medical attention.

16. STORAGE: Store in cool dry place.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**KIL-MOR (2,4-D + mecoprop + dicamba)**  
Ciba Geigy

1. FORMULATIONS: Water soluble solution containing 310 g/L 2,4-D + .80 g/L mecoprop + 110 g/L dicamba; 10 L containers.
2. REGISTERED MIXES: Kil-Mor 45 mL/ac (1.1 L/ha) + Atrazine 80 W 710 g/ac (1.7 kg/ha) in corn.
3. CROPS: Spring (including durum) and winter wheat (7.9), oats (8.6), barley (8.5), sweet (7.3) and field corn (7.3). Underseeding: Not recommended
4. WEEDS CONTROLLED: In crops: Bindweed (hedge), buckwheat (wild) (7.9), cocklebur, corn spurry (7.3), cow cockle (7.6), flax, flixweed (7.8), knotweed, lamb's-quarters (8.5), mustards (8.6), peppergrass, pigweed (prostrate and redroot) (7.9), Russian thistle (7.3), shepherd's-purse (8.6), smartweeds (annual) (7.7), sow-thistle (annual) (8.0), stinkweed (8.8), Tartary buckwheat (7.9), lady's-thumb. Along roadsides: Alders, bull thistle, goat's-beard, ragwort, white cockle.
5. WEEDS SUPPRESSED: Field bindweed, Canada thistle, cleavers.
6. WHEN USED:  
*Spring wheat* - 3-5 leaf stage.  
*Winter wheat* - in spring before crop is 30 cm high  
*Oats* - 3-4 leaf stage  
*Barley* - 2-3 leaf stage  
*Corn* - Overall spray prior to 15 cm height of corn, use drop nozzles after 15 cm height  
*Roadsides* - Spring when weeds are in 2-5 leaf stage and growing actively.
7. HOW TO APPLY:  
**With:** Ground equipment  
**Rate:** Spring wheat, winter wheat, oats, sweet corn - 340-450 mL/ac (850 mL-1.1 L/ha). Roadsides - 1.3 L/ac (3.2 L/ha). Summerfallow - 450-710 mL/ac (1.1-1.7 L/ha).  
**Water Volume:** 40 L/ac (100 L/ha)  
**Pressure:** 275 kPa  
**Ground Speed:** 9 km/h  
**Nozzles:** All standard and low pressure nozzles.
8. SPRAYING TIPS: Barley is the most sensitive crop to Kil-Mor. Ensure that proper rate, water volume and timing is used, otherwise, crop injury may occur.  
Risk of crop injury increases as water volume drops below 36 L/ac (90 L/ha).
9. HOW IT WORKS: Kil-Mor accumulates in the growing points resulting in abnormal growth which disrupts the transport system in plants.
10. EXPECTED RESULTS:  
Weeds: Visible effects occur 7-14 days after spraying. Leaves curl, leaf petioles twist, leaf edges turn brown, whole plant ceases growth and eventually turns brown and dies.  
Crop: Improper applications can result in abnormal bending at the internodes of grain stalks, difficulty in head emergence from sheath, curled awns, malformed kernels and sterile florets.  
Conditions under which poor results may be expected: Inadequate coverage. Rainfall less than 4 hours after application. Weeds overmature.
11. EFFECTS OF RAINFALL: Do not spray if rain is expected within 4 hours.
12. MOVEMENT IN SOIL: Not applicable
13. GRAZING AND CROPPING RESTRICTIONS:  
**Drift:** Tomatoes, sugar beets, sunflowers, beans, turnips, cauliflower, cabbage, ornamentals and fruit crops are very sensitive to drift.  
**Grazing Restrictions:** None.  
**Crop Use After Hail:** No restrictions  
**Succeeding Crops:** No restrictions
14. TOXICITY: Has low acute mammalian toxicity; oral LD<sub>50</sub> rats = 1,028 mg/kg. **Mecoprop has potential to produce enlarged kidneys after long-term continuous exposure.** 2,4-D in formulation contains no dioxin. Non-toxic to fish; toxic to bees.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) to reduce exposure and use standard first aid measures to clean skin and eyes when heavily contaminated. If swallowed, induce vomiting; get medical attention.
16. STORAGE: Heated storage only.

## PRACTICAL USE CONSIDERATIONS

1. Suppression of round-leaved mallow may be expected.
2. May be used on flax as an emergency treatment only.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**KRENITE (fosamine)**  
DuPont

1. FORMULATIONS: Solution - 480 g ammonium salt - 10 L pack.
2. REGISTERED MIXES: Krenite + a non-ionic surfactant.
3. CROPS: Brush control on non-crop land only.
4. WEEDS CONTROLLED: Ash, birch, trembling aspen, pine, and white spruce.
5. WEEDS SUPPRESSED: Not applicable
6. WHEN USED: From mid-June to end of July.
7. HOW TO APPLY:

**With:** High volume. Ground equipment.

**Rate:** Use 10.0-15.0 L/1,000 L of water and add 1-2 L of surfactant to the mixture. Use higher rate for white spruce.

**Cost:** \$13/L

**Water Volume:** Apply 200-1,200 L of spray solution/ac (500-3,000 L/ha) to point of run-off.

8. SPRAYING TIPS: Do not apply to food crops. A non-ionic surfactant is required to control most conifers and to control the root suckering of deciduous brush.
9. HOW IT WORKS: Absorbed by leaves, stems and buds restricts bud development the following spring.
10. EXPECTED RESULTS: Injury may not be observed until the following spring, particularly if minimum rates are used or if cool temperatures prevail when spraying was done. Plants will fail to develop leaves and subsequently die.
11. EFFECTS OF RAINFALL: Rainfall within 24 hours of application may reduce effectiveness.
12. MOVEMENT IN SOIL: Little downward movement as Krenite readily adsorbs to soil colloids.
13. GRAZING AND CROPPING RESTRICTIONS: Grazing Restrictions: Do not graze on land treated with Krenite.
14. TOXICITY: Very low acute mammalian toxicity - oral LD<sub>50</sub> - rats - 20,000 mg/kg. Non-toxic to birds and fish.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). Use standard first aid measures (see page 3) to clean skin and eyes, if contaminated. If swallowed induce vomiting - medical aid.
16. STORAGE: Store in a cool dry place.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

## KROVAR I (bromacil + diuron) DuPont

1. FORMULATIONS: 40% diuron + 40% bromacil, 2 and 25 kg.
2. REGISTERED MIXES: None
3. CROPS: Non-crop land only. Total vegetation control.
4. WEEDS CONTROLLED: Most annual and perennial weeds and grasses.
5. WEEDS SUPPRESSED: Not applicable
6. WHEN USED: Apply Krovar I before weeds emerge or when actively growing. Sufficient moisture is required to carry the chemical to the root zone of the weeds.
7. HOW TO APPLY:

**With:** Boom sprayer, hand gun, back pack, or sprinkling can.

**Rate:**

(i) *General Weed Control:*

Apply 5.5-7.25 kg/ac (13.5-18.0 kg/ha) to control annual and perennial grasses and most broad-leaved weeds. Use higher rates on soils containing 5% or more organic matter or soils high in clay content. Use the 5.5 kg/ac (13.5 kg/ha) rate on sandy or sandy loam soils only.

(ii) *Retreatment:*

Apply 2.75-3.6 kg/ac (6.75-9.0 kg/ha) when annual weeds reappear on previously treated sites.

(iii) *Small Areas:*

180 g Krovar I on 100 sq. m.

**Cost:** \$22/kg

**Water Volume:** Use a minimum of 20 L of water/kg of Krovar I.

8. SPRAYING TIPS: See "soil sterilants" page 4.
9. HOW IT WORKS: Readily absorbed through the roots, leaves and stems.
10. EXPECTED RESULTS: Plants become chlorotic and then die. Poor results occur if weeds are too mature or insufficient rainfall.
11. EFFECTS OF RAINFALL: Rainfall will leach the chemical into the root zone.
12. MOVEMENT IN SOIL: Soil movement is faster with heavier rainfall.  
Do not use in areas subject to soil erosion.
13. GRAZING AND CROPPING RESTRICTIONS:  
*Drift:* All crops and ornamentals may be injured by chemical drift.  
*Succeeding Crops:* Krovar I is a non-selective residual herbicide. It should only be used on non-crop land where bare ground is desired.
14. TOXICITY: Very low acute mammalian toxicity - oral LD<sub>50</sub> - rats - bromacil - 5,200 mg/kg, diuron - 3,400 mg/kg. Non toxic to birds, toxic to fish - **long-term exposure may cause enlarged spleen.**
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). Use standard first aid methods (see page 3) if necessary.
16. STORAGE: Store in a cool, dry place.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**LADDOK (bentazon + atrazine)**  
**BASF**

1. FORMULATIONS: Flowable - bentazon - 200 g/L + atrazine 200 g/L - 10 L pack.
2. REGISTERED MIXES: None
3. CROPS: Corn (field, silage, sweet)
4. WEEDS CONTROLLED: black nightshade, cocklebur, common chickweed, common groundsel, common ragweed, corn spurry, lamb's-quarters, purslane, redroot pigweed, smartweed, wild mustard.
5. WEEDS SUPPRESSED: None.
6. WHEN USED: Apply 18 to 28 days after seeding. Corn tolerant at all growth stages.
7. HOW TO APPLY:

**With:** Ground or air.

**Rate:** 1.2-1.6 L/ac (3-4 L/ha). Assist oil concentrate - 10 L/1000 L of spray volume is recommended.

**Cost:** \$10/L

**Water Volume:** 80-160 L/ac (200-400 L/ha)

**Pressure:** 275-400 kPa

**Ground Speed:** 6 km/h

**Nozzles:** Flat fan or cone type. Do not use flood jet type.

8. SPRAYING TIPS: Best results if weeds are young and actively growing.
9. HOW IT WORKS: Both bentazon and atrazine are contact herbicides interfering with photosynthesis.
10. EXPECTED RESULTS: Weeds turn yellow, then brown, usually within two weeks. Crops occasionally show light leaf speckling. Poor results may occur if weeds are too mature, **failure to penetrate crop canopy or under conditions of prolonged cool weather** or drought.
11. EFFECTS OF RAINFALL: Within 6-8 hours may reduce activity.
12. MOVEMENT IN SOIL: Very little, except in sandy soil and with excessive moisture.
13. GRAZING AND CROPPING RESTRICTIONS:  
*Grazing Restrictions:* Treated plants can be used for silage.  
*Succeeding Crops:* On very light soils with low organic matter some atrazine may carry over and injure susceptible crops.
14. TOXICITY: Has low acute toxicity to mammals - oral LD<sub>50</sub> - rats - 3000 mg/kg.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). Use standard first aid measures (see page 3) to clean skin and eyes.
16. STORAGE: Store in a cool dry place above 0°C.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**LEXONE (metribuzin)**  
DuPont

1. FORMULATIONS: Lexone DF (75% dry flowable), 2.5 kg container. Lexone L (480 g/L), 10 L container.
2. REGISTERED MIXES: Lexone DF + Treflan. Lexone (both forms) + MCPA amine or Banvel. Lexone DF + Eptam
3. CROPS: Wheat (8.5), barley (not Klondike) (8.9), potatoes (8.6) (except red skinned, early Shepody, ND 146-4R, Rideau, Belleisle or Tobique), tomatoes, lentils, fababeans, field peas.
4. WEEDS CONTROLLED: Chickweed (8.1), stinkweed (8.2), corn spurry (7.1), volunteer rapeseed (8.8), hemp-nettle (8.4), ball mustard (8.0), wild mustard (8.0), lamb's-quarters (8.4), lady's-thumb, smartweeds (annual) (8.5), red root pigweed, shepherd's-purse.
5. WEEDS SUPPRESSED: None
6. WHEN USED: Wheat, barley - 2-5 leaf stage

*Tomatoes:* Tomato transplants grown for processing only. Apply as directed spray before weeds are 4 cm high.

*Potatoes:* Do not use on sandy or coarse textured soils containing less than 1% organic matter as crop injury may result. Potato varieties vary in their resistance to Lexone. Use on limited area to determine safety before large scale sprays are adopted.

*Irrigated Potatoes (except Belleisle and Tobique):* Pre-emergence - single application after planting (at least 5 cm deep) or hilling before crop emerges. Early post-emergence - apply following 3 or more days of sunny weather. Treat before weeds are 3 cm and potatoes are less than 10 cm. Some leaf burn may occur. Pre-emergence + post-emergence - follow above directions but do not apply more than 0.57 kg/ac (1.4 kg/ha) per season.

*Non-Irrigated Potatoes:* Early post-emergence - apply soon after emergence and before weeds are 4 cm high. Preplant incorporated - apply as by Eptam label. Crop injury may occur if used on soil with greater than 7% organic matter or on sandy or coarse textured soils with less than 2% organic matter.

*Lentils:* vines should be less than 10 cm high and planted more than 5 cm below the soil.

*Fababeans:* Treflan as a preplant incorporated treatment in the fall or spring.

**7. HOW TO APPLY:**

**With:** Ground equipment

**Rate:** Wheat - Lexone DF - 110 g/ac (270 g/ha). Can be tank mixed with Banvel at 110 mL/ac (275 mL/ha) or MCPA amine-500 at 345-445 mL/ac (850-1100 mL/ha) for broader weed spectrum.

Barley - Lexone DF - 110-140 g/ac (270-350 g/ha). Can be tank mixed with MCPA amine-500 at 345-445 mL/ac (850-1100 mL/ha). The low rate can be mixed with Banvel at 110 L/ac (275 mL/ha).

*Potatoes - Irrigated*

Pre-emergence: 260-570 g/ac (0.64-1.4 kg/ha) in 60-120 L water/ac (150-300 L water/ha). Early post-emergence: 285-390 g/ac (700-960 g/ha) Pre-emergence + post-emergence: apply no more than 565 g/ac (1.4 kg/ha).

*Potatoes - Dryland*

Early post-emergence: 140 g/ac (350 g/ha). Preplant incorporated: 140-200 g/ac (350-500 g/ha) Lexone DF plus 1.7-1.8 L/ac (4.2-4.4 L/ha) Eptam in 80-120 L water/ac (200-300 L water/ha).

*Lentils* - 115 g/ac in minimum 40 L water/ac (280 g/ha in minimum 100 L water/ha)

*Fababeans* - Spring preplant incorporate - 140-200 g/ac (350-500 g/ha) plus 810 mL/ac (2.0 L/ha) Treflan. Fall preplant incorporate -160-220 g/ac (400-550 g/ha) plus 810 mL-1.05 L/ac (2.0-2.6 L/ha) Treflan.

*Tomatoes* - 200-710 mL/ac (500 mL-1.75 L/ha)

**Cost:** Lexone DF - \$58/kg - Lexone L - \$37/L.

**Nozzles:** Stainless steel nozzles are recommended. Do not use flood-jet nozzles.

**8. SPRAYING TIPS:** Use 50 mesh line strainer and screens. Do not spray if rain is expected within 2 hours. Allow 4-5 day interval before or after the application of wild oat herbicides. If frost occurs, allow 4-5 day interval for crop to recover before applying Lexone. Crop must be planted at least 5 cm deep. Do not apply to tomatoes within 60 days of harvest.

**9. HOW IT WORKS:** A systemic herbicide absorbed by foliage and roots. Affected plants become chlorotic and stunted. Death usually occurs 10-14 days after treatment. Because Lexone leaves a residue in the soil, control of shallow germinating weeds (eg. chickweed) occurs throughout the growing season.

**10. EXPECTED RESULTS:**

*Weeds:* Should start to yellow within 7-10 days after treatment.

*Crop:* Temporary (7-10 days) lightening in crop color and occasionally a slight reduction in crop height may occur, especially if frost or abnormally high temperatures occur within 1-2 days of application. Poor results may be expected if it rains immediately after application or weeds are under stress or too mature.

**11. EFFECTS OF RAINFALL:** Heavy rainfall immediately after application may decrease activity.

**12. MOVEMENT IN SOIL:** Not applicable

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**13. GRAZING AND CROPPING RESTRICTIONS:**

*Grazing Restrictions:* Do not graze or feed to livestock within 30 days of application.

*Succeeding Crops:* No restrictions.

*NOTE:* Potatoes - do not apply within 60 days of harvest.

**14. TOXICITY:**

- very low acute mammalian toxicity; oral LD<sub>50</sub> rats = 1,100 mg/kg
- slightly toxic to fish and birds; non-toxic to bees

**15. PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page 2) to avoid exposure. Use standard first aid measures (see page 3) to clean skin and eyes if exposed. Induce vomiting if swallowed; get medical attention. Wear goggles when spraying.

**16. STORAGE:** Lexone DF - Cool dry place. Lexone L - warm storage preferred. If frozen ensure material has been thoroughly mixed before using.

**PRACTICAL USE CONSIDERATIONS**

1. Shake the Lexone L container well before adding to the sprayer tank.

2. Initial studies have shown that there can be more injury to barley when there is shading for 12 hours immediately after spraying Lexone. Thus, try to avoid spraying Lexone in the late evening or on a cloudy day.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**LONTREL (clopyralid)**  
**DOW**

1. FORMULATIONS: Emulsifiable concentrate, 200 g/L; 4 L container.
2. REGISTERED MIXES: None
3. CROPS: Canola/Rapeseed (8.6). Underseeding not recommended for forage legumes.
4. WEEDS CONTROLLED: Canada thistle (8.3), scentless chamomile, wild buckwheat (6.1), volunteer sunflower, common ragweed, narrow-leaved hawk's-beard.
5. WEEDS SUPPRESSED: Annual smartweed, Lamb's-quarters, tartary buckwheat, cocklebur, cleavers, red-root pigweed, round-leaved mallow, perennial sow-thistle (top growth control) (7.0).
6. WHEN USED: 2-6 leaf stage of canola (rapeseed).
7. HOW TO APPLY:

**With:** Ground equipment

**Rate:** 405-605 mL/ac (1.0-1.5 L/ha).

**Cost:** \$58/L

**Water Volume:** 40 L/ac (100 L/ha)

**Pressure:** 200-275 kPa

**Nozzles:** All standard nozzles delivering 40 L/ac (100 L/ha).
8. SPRAYING TIPS: Treat during warm weather when weeds are actively growing.
9. HOW IT WORKS: Absorbed by leaf and stem surfaces and readily translocated. Maximum efficacy results from foliar application to young actively growing plants.
10. EXPECTED RESULTS: Growth will first slow then cease. Death of weed will not occur until 14-21 days after treatment.
11. EFFECTS OF RAINFALL: A rain free period of 4-6 hours is required.
12. MOVEMENT IN SOIL: Small amounts may carry over in soil into the year after treatment, but is generally not mobile in soil under typical prairie conditions.
13. GRAZING AND CROPPING RESTRICTIONS:

*Drift:* Small amounts of drift may damage broad-leaved plants.

*Rotational Crops Recommended:* Wheat, barley, oats, rye, flax, canola, summerfallow.

*Grazing Restrictions:* None

*Succeeding Crops:* Do not plant lentils the year following treatment.
14. TOXICITY:
  - has very low acute toxicity to mammals and humans
    - rats LD<sub>50</sub> greater than 5,000 mg/kg
    - bees LD<sub>50</sub> greater than 100 ug/bee
    - fish - extremely low in toxicity
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) to reduce exposure and use standard first aid measures (see page 3) to clean skin and eyes. If swallowed, induce vomiting. Get medical attention.
16. STORAGE: Store away from food, feedstuffs, fertilizer, seeds, insecticides, fungicides, or other pesticides. Store in heated storage. If frozen, warm to room temperature and agitate.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**LOROX L (linuron)**  
**Dupont**

1. FORMULATIONS: Flowable suspension - 480 g/L, 10 L container.
2. REGISTERED MIXES: Lorox L + MCPA amine, Lorox L + Atrazine 80W (field corn), Lorox L + Estamine, Lorox L + Sweep + MCPA amine, Lorox L + Target.
3. CROPS: Use Lorox L alone on asparagus (8.7), carrots (8.2), field corn (6.5), potatoes (8.7), shelterbelts and fruit trees (apple, pear, plum, cherry). Use Lorox L + MCPA amine 500 tank mix on wheat (spring, durum) (8.2), oats (8.9), barley (8.6). Underseeding: Do not use on crops underseeded to forage crops. Use Lorox L + MCPA amine + Sweep for fallow weed control.
4. WEEDS CONTROLLED: Lorox L controls: foxtail (green and yellow) (6.7), barnyard grass (8.3), buckwheat (wild) (8.5), chickweed (9.0), corn spurry (8.7), cow cockle, goosefoot (8.4), groundsel (8.6), knotweed, kochia (6.4), lamb's-quarters (7.9), mustard (wormseed) (8.9), pigweed (prostrate and redroot) (8.3), purslane (8.4), ragweed, shepherd's-purse (9.0), smartweeds (annual) (9.0), sow-thistle (annual), stinkweed (8.5), wild radish. Lorox L + MCPA amine 500 tank mix controls above weeds plus tartert buckwheat (7.3), cocklebur, common burdock, goat'sbeard, green smartweed (7.0), hemp-nettle (7.5), lady's thumb (7.0), mustard (ball, hare's ear, Indian, tumble, wild (8.8), stork's-bill (8.3).
5. WEEDS SUPPRESSED: Canada thistle (4.4).
6. WHEN USED: 2-4 leaf stage of most weeds, 1-3 leaf stage of green foxtail.

Crop stage:

*Corn:* Pre-emergence (Lorox L + atrazine). Post-emergence Lorox L alone after corn is at least 38 cm high. DIRECTED SPRAY.

*Cereals:* 2-4 leaf stage

*Carrots:* (post-emergence) 2 or more fully developed true leaves, 10-15 cm in height.

*Asparagus:* immediately after discing, before emergence, may be repeated after last cutting.

*Potatoes* (pre-emergence): before grassy weeds are 8 cm tall and broad-leaf weeds 15 cm tall.

*Shelterbelts:* Apply only on stock planted for at least one year as directed spray under trees and bushes. Apply before weeds are 10 cm high and before buds open in spring.

*Fruit trees:* Apply as a directed spray under trees and bushes. Apply before weeds are 10 cm high and before buds open in spring.

*Fallow:* Once per season in spring when weeds are 2-4 leaf.

7. HOW TO APPLY:

**With:** Ground equipment

**Rate:** *Cereals and flax:* Lorox L at 170-225 mL/ac (425-550 mL/ha) plus 345-445 mL/ac (0.8-1.1 L/ha) MCPA amine.

*Field Corn - Pre-emergence:*

(a) Low organic soils (2% or less) Lorox L - 0.9 L/ac (2.2 L/ha) + Atrazine 80W - 0.6 kg/ac (1.5 kg/ha)

(b) Medium organic soils (2 to 5%) Lorox L - 1.3 L/ac (3.2 L/ha) + Atrazine 80W - 0.9 kg/ac (2.2 kg/ha)

Post-emergence: Lorox L 1.0-1.8 L/ac (2.4-4.5 L/ha) plus an oil water emulsion as a DIRECTED SPRAY.

*Carrots:* Pre-emergence (crop) - 450-1375 mL/ac (1.1-3.4 L/ha) in 80-120 L water/ac (200-300 L water/ha). Post-emergence (crop) - 0.9-1.8 L/ac (2.2-4.5 L/ha) in 80-120 L water/ac (200-300 L water/ha). Combination pre-emergence and post-emergence (crop) - 450-1900 mL/ac (1.1-2.2 L/ha) followed by 0.9-1.8 L/ac (2.25-4.5 L/ha), provided treatments are at least two weeks apart.

*Asparagus:* Pre-emergence (crop - 1.4-1.8 L/ac (3.4-4.5 L/ha) in 120 L water/ac (300 L water/ha).

*Potatoes:* Pre-emergence (crop) - 0.9-1.8 L/ac (2.2-4.5 L/ha) in 120 L water/ac (300 L water/ha).

*Shelterbelts:* single application of 1.8 L/ac (4.5 L/ha).

*Fruit trees:* single application of 3.6 L/ac (9.0 L/ha) Lorox L plus surfactant in 160-240 L/ac (400-600 L/ha) water.

*Fallow:* Lorox L at 210 mL/ac (.52 L/ha) plus MCPA and Sweep at recommended rates.

**Cost:** \$20/L

**Water Volume:** 40 L/ac (100 L/ha)

**Incorporation:** Not applicable

**Pressure:** 275 kPa

**Ground Speed:** 9 km/h

**Nozzles:** Stainless steel nozzles are recommended. Do not use flood-jet type.

8. SPRAYING TIPS:

(a) Use 50 mesh line strainers and screens

(b) Fruit trees - avoid contact with fruit, foliage, and green bark with spray or drift as injury may result.

9. HOW IT WORKS: A systemic herbicide absorbed by leaves and roots. Yellowing (chlorosis), stunting and finally death occurs 10-14 days after treatment.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

10. EXPECTED RESULTS:  
*Weeds:* Yellowing will start 7-10 days after application. Effect is greatest when growing conditions are excellent. Weed control will vary depending on species, time of application and growing conditions.  
*Crop:* A slight yellowing of the crop and leaf tip and leaf margin burn may be seen 7-10 days after application. Crop recovers within 14-18 days.
11. EFFECTS OF RAINFALL: Heavy rainfall within 2 hours may decrease activity.
12. MOVEMENT IN SOIL: Not applicable.
13. GRAZING AND CROPPING RESTRICTIONS: Succeeding Crops: No restrictions, except when mix with atrazine is used. See atrazine.
14. TOXICITY: Has very low acute toxicity to mammals; oral LD<sub>50</sub> rats = 1,500 mg/kg. Very toxic to fish; non-toxic to bees.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). Use standard first aid measures (see page 3) when skin and eyes are heavily exposed. If swallowed, induce vomiting. Get medical attention.
16. STORAGE: Lorox L - Store in a heated area. Do not freeze as settling may occur. If frozen, thoroughly mix to resuspend.

## PRACTICAL USE CONSIDERATIONS

1. Lorox L, applied pre-emergence, requires rainfall or irrigation for activation.
2. At rates of 1.8 L/ac (4.5 L/ha), approximately 25% of the chemical is carried over into the next growing season.
3. Avoid application during periods of high heat as chances of crop injury are increased.
4. Shake the container well before adding to the spray tank.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**MATAVEN (flamprop-methyl)**  
Ciba-Giegy

1. FORMULATIONS: Emulsifiable concentrate, 84 g/L; 20 L container.
2. REGISTERED MIXES: None  
Mixing instructions: Add the required amount of Mataven to half the required water volume in the spray tank, start agitation, then add the balance of the water. The resulting emulsion is relatively stable, requiring only gentle agitation. The spray may require agitation to re-emulsify if allowed to stand for several hours.
3. CROPS: Wheat (spring, (except Selkirk), durum, winter) (8.9), canary grass (8.7), triticale (8.2), forage crops grown for seed in year of seeding: alfalfa (8.3), bromegrass (8.6), meadow fescue (8.5), creeping red fescue (9.0), Russian wild ryegrass (8.7), intermediate wheatgrass (9.0), and crested wheatgrass (8.3).
4. WEEDS CONTROLLED: Wild oats (8.0)
5. WEEDS SUPPRESSED: None
6. WHEN USED: 3 leaf to shot blade stage of the wild oats; wild oats at the 2 leaf stage and younger may escape control and may grow to maturity. Do not apply beyond the 6 leaf stage of the crop.
7. HOW TO APPLY:

**With:** Aircraft or ground equipment.

**Rate:** 2 L/ac (5.0 L/ha) or 2-3 L/ac (5.0-7.5 L/ha) with grass forage crops using the high rate when forage crops are grown without a companion crop and the low rate when grown with wheat as a companion crop.

**Cost:** \$7/L

**Water Volume:** Aircraft - minimum - 8 L/ac (20 L/ha)  
Ground - 40 L/ac (100 L/ha)

**Nozzles:** Standard nozzles delivering 40 L/ac (100 L/ha) at 9 km/h

**Pressure:** 300 kPa

8. SPRAYING TIPS:

- (a) Best results will be obtained when the majority of wild oats are at the 3-4 leaf stage, but before the shot blade stage.
- (b) Allow 4-day interval between the application of Mataven and the use of MCPA, Torch, Blagal, Buctril M or Brominal M and an interval of 7 days with the use of 2,4-D or Banvel formulations.
- (c) The 40 L/ac (100 L/ha) spray volume will provide better control of wild oats, especially where there is a heavy crop canopy or dense growth of wild oats.
- (d) Direct spray pattern 45° forward to enhance spray penetration.

9. HOW IT WORKS: A systemic herbicide absorbed through the leaves and translocated to the growing point. Cell elongation is inhibited and cell initiation and division is impaired. The wild oat is killed, or stunted so that it is unable to compete with the crop.

10. EXPECTED RESULTS:

Weeds: Initially a dark blue-green color appears 10 days after spraying then the wild oats turn yellow and brown. Wild oats in the 1-2 leaf stage at application may often appear controlled but may escape and grow to maturity. Will be small, stunted plants with few shrivelled seeds.

11. EFFECTS OF RAINFALL: Rainfall within 2 hours of application will reduce effectiveness.

12. MOVEMENT IN SOIL: Not applicable.

13. GRAZING AND CROPPING RESTRICTIONS:

*Drift:* Drift potential is low. Oats would be the most seriously affected crop.

*Grazing Restrictions:* Do not graze treated areas.

*Crop Use After Hail:* Do not graze or feed to livestock.

*Succeeding Crops:* No restrictions.

14. TOXICITY: Has very low acute mammalian toxicity; oral LD<sub>50</sub> rats = 5,000 mg/kg. Non-toxic to bees. Eye irritant
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) plus goggles when handling this product. Use standard first aid measures (see page 3) to clean skin and eyes. If swallowed, do not induce vomiting distillates. Get medical attention.
16. STORAGE: Heated storage is recommended. If frozen warm and agitate to resuspend.

## PRACTICAL USE CONSIDERATIONS

1. Has been noted to injure Garnet wheat in the Peace River region. Injury is similar to that on Selkirk.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**MCPA (amine, ester, salts)**  
Numerous Trade Names

1. FORMULATIONS:

MCPA amine - 500 g/L;  
 MCPA ester - 500 g/L;  
 MCPA Potassium salt - 400 mL;  
 MCPA Sodium salt - 300 g/L in 20 L containers.  
 Phenoxylene Plus - 250 g/L as sodium and potassium salts - 20 L container.

2. REGISTERED MIXES:

- (a) MCPA amine + Afolan F, Banvel, Lexone, Lorox L, Pardner, Sencor, Sweep, TCA, Torch
- (b) MCPA ester + Avenge, Pardner, Sweep, Torch
- (c) MCPA Potassium Salt + Banvel
- (d) MCPA Sodium Salt + TCA
- (e) Some formulations can be mixed with liquid fertilizers (28-0-0).

Mixing restrictions: Insure that the proper formulation of MCPA is used with the product considered for mixing.

3. CROPS:

<b>MCPA amine</b>	<b>MCPA ester</b>	<b>MCPA Postassium Salt</b>	<b>MCPA Sodium Salt</b>
Hard red spring (8.7), durum, winter wheat, barley (8.7), oats (9.0), fall rye, flax (8.5), asparagus, peas (field and processing), pastures and non-cropland.	Hard red spring (8.7), winter wheat, barley (8.0) oats (9), rye, flax pastures and non-cropland	Wheat, barley, oats, flax	Wheat, barley, oats, flax, rye, asparagus, peas, pasture non-cropland

Underseeding: Not recommended

4. WEEDS CONTROLLED:

<b>MCPA amine</b>	<b>MCPA ester</b>	<b>MCPA Potassium Salt</b>	<b>MCPA Sodium Salt</b>
American dragonhead, biennial wormwood, bluebur, cocklebur, common burdock, flixweed, goat's-beard, goosefoot, hairy galinsoga, lamb's-quarters, mustard (ball, dog, hare's-ear, tumble, wild, wormseed), peppergrass (common), pigweed (Russian and redroot), purslane, ragweed (common), stinkweed, thyme-leaved spurge	Lamb's-quarters (8.5), mustard (ball, hare's-ear, tumble, wild, wormseed), ragweed (common), stinkweed (8.3)	Lamb's-quarters (8.5), mustard (ball, hare's-ear, tumble, wild, wormseed), ragweed (common), stinkweed (8.3)	Same as for potassium

5. WEEDS SUPPRESSED:

<b>MCPA amine</b>	<b>MCPA ester</b>	<b>MCPA Postassium Salt</b>	<b>MCPA Sodium Salt</b>
Annual smartweed (4.9), tartary buckwheat (4.3), wild buckwheat (4.7), Canada thistle, hemp-nettle (5.8), knapweed (Russian), leafy spurge, plantain (common), shepherd's-purse, sow-thistle (annual, perennial), wild radish	same as amino and pigweed (Russian and redroot)	Bluebur plus weeds shown under MCPA amine and ester.	Same as for potassium

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

6. WHEN USED:

Crop	MCPA amine	MCPA ester	MCPA Potassium	MCPA Sodium
Barley, oats, spring wheat	4 leaf to just before flag leaf stage	4 leaf to just before flag leaf stage	2-6 leaf stage	4 leaf to just before flag leaf stage
Winter wheat fall rye	Before crop tillering in the spring	Before crop tillering in the spring	Not recommended	Before crop tillering in the spring
Flax		From 5 cm to just before bud formation	5-10 cm high	From 5 cm height to just before bud formation
Peas	When crop is 10-18 cm	Not recommended	Not recommended	When crop is 10-18 cm
Asparagus	Following cultivation just before first spears appear. May repeat at end of cutting season	Not recommended	Not recommended	Following cultivation just before first spears appear. May repeat at end of cutting season
Pastures		Before growth of grasses and legumes begins in the spring.	Not recommended	Before growth of grasses and legumes begins in the spring.

7. HOW TO APPLY: **With:** Ground equipment or aircraft

Rate:	Crop	MCPA amine	MCPA ester
	Wheat, oats, Barley, rye, Flax	280-700 mL/ac (700 mL-1.7 L/ha)	280-700 mL/ac (700 mL-1.7 L/ac)
	Fall rye, Winter wheat	280-700 mL/ac (700 mL-1.75 L/ha)	280-700 mL/ac (700 mL-1.75 L/ac)
	Peas	280 mL/ac (700 mL/ha)	—
	Pastures & non-cropland	450-800mL/ac (1.1-2 L/ha)	450-800 mL/ac (1.1-2 L/ha)
	Asparagus	1.4 L/ac (3.5 L/ha)	—

Crop	MCPA K-Salt	MCPA Na-Salt
Wheat, oats, Barley, rye, Flax	600-800 mL/ac (1.5-2 L/ha)	490 mL-1.1 L/ac (1.2-2.75 L/ha)
Fall rye, Winter wheat	— (1.5-2 L/ha)	490 mL-1.1 L/ac (1.2-2.75 L/ha)
Peas	—	600 mL/ac (1.5 L/ha)
Pastures & non-cropland	—	710 mL-1.3 L/ac (1.75-3.25 L/ha)
Asparagus	— (3.5 L/ha)	— (5.5 L/ha)

**Mixture Rates:** MCPA ester up to 450 L/ac (1.1 L/ha) + Avenge 1.4 or 1.7 L/ac (3.5 or 4.2 L/ha). MCPA ester 230 mL/ac (560 mL/ha) + Torch 490-610 mL/ac (1.2-1.5 L/ha) + Avenge 200C 1.4 or 1.7 L/ac (3.5 or 4.2 L/ha).

**Cost:** \$3-4/L

**Water Volume:** Aircraft - minimum 8 L/ac (20 L/ha). Ground equipment - 40 L (100 L/ha) for all crops except peas. On peas apply amine in a minimum of 70 L/ac (170 L/ha) or Na salt in a minimum of 60 L/ac (150 L/ha).

**Pressure:** 275 kPa

**Ground Speed:** 9 km/h

8. SPRAYING TIPS: Do not spray when air temperature is above 27°C. Extremely hard water may reduce performance or cause problems in spraying the product.
9. HOW IT WORKS: A systemic herbicide absorbed by leaf and stem surfaces and translocated to the actively growing regions. MCPA disrupts cell division, causing abnormal growth response, thereby affecting respiration and food reserves.
10. EXPECTED RESULTS: **Weeds:** Weeds start to twist between 2 to 20 days after spraying, depending on weather conditions, formulation and weeds. Following the twisting and bending, plants will turn brown and then die. Only emerged weeds will be controlled. **Crops:** Yellowing and thinning of the crop may be noticed if higher than recommended rates are used. Poor results may occur if extremely hard water is used.
11. EFFECTS OF RAINFALL: Rain within 2 hours of application will decrease activity.
12. MOVEMENT IN SOIL: Readily leached from soil. Longer residual in dry soil.
13. GRAZING AND CROPPING RESTRICTIONS: **Drift:** Danger from drift with amine and salts is lower than from esters. **Grazing Restrictions:** Do not graze dairy cattle within 7 days after spraying.
14. TOXICITY: Has low acute mammalian toxicity, oral LD<sub>50</sub> rats = 700 mg/kg; very toxic to fish.
15. PRECAUTIONS AND FIRST AID: Wear standard protective clothing (see page 2) to reduce exposure. Use standard first aid measures (see page 3) to clean skin and eyes after heavy contamination. If salt and amine formulations are swallowed, induce vomiting. Do not induce vomiting if ester formulations are swallowed. Get medical attention in all cases.
16. STORAGE: If frozen, warm to 5°C and mix well before using.

### PRACTICAL USE CONSIDERATIONS

1. When using MCPA (amine) on cereals underseeded with legumes use 0.28 L/ac (0.7 L/ha).

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**MECOTURF (mecoprop)**  
**May & Baker**

1. FORMULATIONS: Water soluble 150 g/L; 4 and 20 L container.
2. REGISTERED MIXES: None.
3. CROPS: Wheat (spring, durum) (8.3), barley (9.0), oats, lawns and turf.  
Underseeding: Not recommended
4. WEEDS CONTROLLED: Black medic, buttercup, clover, chickweed (7.6), corn spurry (7.3), dandelion, plantain.
5. WEEDS SUPPRESSED: Canada thistle (4.6)

6. WHEN USED:  
*Crop:* 3 leaf to early flag leaf stage.  
*Weeds:* 2-4 leaf stage.

7. HOW TO APPLY:

**With:** Ground equipment

**Rate:** Cereals - 2.2-2.8 L/ac (5.5-7 L/ha). Lawns, turf - 2.2-3.4 L/ac (5.5-8.5 L/ha).

**Cost:** \$5/L

**Water Volume:** Cereals - 80-120 L/ac (200-300 L/ha). Lawns, turf - 80-160 L/ac (200-400 L/ha)

**Pressure:** 300 kPa

**Ground Speed:** 9 km/h

**Nozzles:** With 80-120 L/ac (200-300 L/ha) capacity.

8. SPRAYING TIPS:  
(a) Recommended water volume is essential for optimum weed control.  
(b) Cold weather and drought may cause a delay in weed control action.
9. HOW IT WORKS: A systemic herbicide which disrupts the plant's translocation system causing the accumulation of plant food in the shoots and subsequent starvation of the roots.
10. EXPECTED RESULTS:  
*Weeds:* Leaf curling and stem twisting should be visible within 4-5 days after spraying. Weeds should be completely dead within 3-4 weeks of application.  
*Crop:* Deformed heads, missing florets and twisted awns could result if recommendations are not followed or if crop is under stress conditions.
11. EFFECTS OF RAINFALL: Rain within 4-6 hours will reduce effectiveness.
12. MOVEMENT IN SOIL: Not applicable.
13. GRAZING AND CROPPING RESTRICTIONS:  
*Drift:* Danger of vapor drift is low.  
*Grazing Restrictions:* Do not graze within 14 days of application.  
*Crop Use After Hail:* No restrictions if 14 days after application.  
*Succeeding Crops:* No restrictions.
14. TOXICITY: Has very low acute mammalian toxicity; oral LD<sub>50</sub> rats = 1,060 mg/kg. Has potential to cause enlarged kidneys following long-term exposure to this product.
15. PRECAUTIONS AND FIRST AID: Wear standard protective clothing (see page 2) to reduce exposure. Use standard first aid measures (see page 3) to clean skin and eyes. If swallowed, induce vomiting. Get medical attention.
16. STORAGE: Store above 0°C. If stored for 1 year or longer, shake well before using.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**PATORAN (metobromuron)**  
Ciba-Geigy/BASF

1. FORMULATIONS: 50% Wettable Powder, 2.75 kg bag  
670 g/L Flowable, 20 L pail  
400 g/L Flowable, 10 L pail
2. REGISTERED MIXES: Patoran + Dual Ciba-Geigy 960E
3. CROPS: Potatoes, soy, lima, adzuki, dry and snap beans.
4. WEEDS CONTROLLED: Annual bluegrass, barnyard grass, chickweed, corn spurry, green foxtail, groundsel, lamb's-quarters, mustard, pigweeds, purslane, ragweed, shepherd's-purse, smartweeds, stinkweed.
5. WEEDS SUPPRESSED: Annual grasses.
6. WHEN USED: Post plant but pre-emergent to crop and weeds.  
— Patoran can be applied either as:  
1. A pre-emergent spray in tank mix combination with Dual Ciba-Geigy.  
2. A pre-emergent spray preceded by a pre-plant incorporated spray of Dual Ciba-Geigy.
7. WHEN USED:

**With:** Ground equipment

**Rate:**

Crop	50 WP kg/ac (kg/ha)	670 FW L/ac (L/ha)	FL L/ac (L/ha)
Potatoes	1.3-2.2 (3.2-5.5)	1.0-1.7 (2.5-4.2)	1.7-3.4 (4.2-8.5)
Soybeans	1.3-1.8 (3.2-4.5)	1.0-1.3 (2.5-3.2)	1.7-2.2 (4.2-5.5)
Adzuki beans	1.1-2.0 (2.7-5.0)	0.8-1.7 (2-4.25)	1.7-2.2 (4.2-5.5)
Other beans	1.1-2.0 (2.7-5.0)	0.8-1.7 (2.0-4.25)	1.4-1.7 (3.5-4.25)

Do not use on the bean variety "Slim Green". Use the lower rate for the bean varieties "Yellow Eye", "Cranberry", "White Kidney", "Light-red Kidney", and "Dark-red Kidney".

**Water Volume:** 70-140 L/ac (170-350 L/ha) with Patoran 670 FW.  
120-160 L/ac (300-400 L/ha) with Patoran 50 WP.  
100-160 L/ac (250-400 L/ha) with Patoran FL.

**Incorporation:** Do not soil-incorporate Patoran.

**Pressure:** 275 kPa

**Ground Speed:** 9 km/h

**Nozzles:** Use nozzles capable of delivering 70-160 L/ac (170-400 L/ha) at a pressure of 275 kPa. Nozzle screens should be 50 mesh size or larger.

8. SPRAYING TIPS:
  - (a) Do not let spray tank mixture stand without agitation before use.
  - (b) Keep by-pass line on or near the bottom of spray tank to prevent foaming.
  - (c) Do not apply Patoran to light textured soils of less than 2% organic matter.
9. HOW IT WORKS: Absorbed through the roots, inhibits photosynthesis.
10. EXPECTED RESULTS: Weed emergence will be inhibited or absent. Under dry conditions, some weed emergence and early die back can occur. Uptake is moisture dependent, so cultivation may be necessary to put it in contact with moist soil.
11. EFFECTS OF RAINFALL: Enhance efficacy.
12. MOVEMENT IN SOIL: Patoran can be leached on light soils.
13. GRAZING AND CROPPING RESTRICTIONS: Not applicable.
14. TOXICITY: Has very low acute mammalian toxicity; oral LD<sub>50</sub> rats = 5,000 mg/kg. Non-toxic to fish and birds; slightly toxic to bees.
15. PRECAUTIONS AND FIRST AID: Wear standard protective clothing (see page 2) to reduce skin exposure. Use standard first aid measures (see page 3) to clean skin and eyes. Get medical attention for eyes. If swallowed, induce vomiting and get immediate medical attention.
16. STORAGE: Flowable formulations should be kept in warm storage. If frozen, warm thoroughly then agitate to resuspend.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**POAST (sethoxydim)**  
BASF

1. FORMULATIONS: Emulsifiable concentrate 184 g/L; 7 L container.
2. REGISTERED MIXES: Poast + Buctril M or Bröminal M or Bromox 450. Poast + MCPA (amine or ester). Use mixture on Flax only.
3. CROPS: Canola, flax, soybeans, sugar beets.
4. WEEDS CONTROLLED: Green foxtail, yellow foxtail, barnyard grass, wild oats, barley, oats, wheat, corn, Persian darnel, wild proso millet.
5. WEEDS SUPPRESSED: Not applicable.
6. WHEN USED: Apply when weeds are 1-6 leaf stage or 10-15 cm in height.
7. HOW TO APPLY: Assist Oil Concentrate must be added to all applications of Poast.

**With:** Ground or air.

**Cost:** \$54/L

**Rate:** Green and yellow foxtail, barnyard grass, wild proso millet, Persian darnel - 325 mL/ac (0.8 L/ha). Wild oats - 570 mL/ac (1.4 L/ha); heavy infestations 650 mL/ac (1.6 L/ha). Wheat, oats - 650 mL/ac (1.6 L/ha). Barley - 790 mL/ac (1.9 L/ha).

**Cost:** \$54/L

Water Volume	Amount of Assist
20-45 L/ac (50-110 L/ha)	200 mL/ac (0.5 L/ha)
45-100 L/ac (110-250 L/ha)	810 mL/ac (2 L/ha)
Aerial application 45 L/ac (110 L/ha)	200-400 mL/ac (0.5-1.0 L/ha)

**Pressure:** 275-425 kPa

**Ground Speed:** 9 km/h

**Nozzles:** 80° stainless steel flat fan nozzles are optimum. Flood jet or hollow cone nozzles are not recommended.

**8. SPRAYING TIPS:**

- (a) Tilt nozzles forward 45° for better coverage.
- (b) Treat when weedy grasses are actively growing, there is good soil moisture and the crop is small enough to permit thorough spray coverage.
- (c) Mixing instructions: With agitator running, fill the spray tank with ½ required amount of water. Add Poast then broadleaf herbicide, if required, add Assist Oil Concentrate, then remainder of water. **Do NOT allow spray mixture to sit overnight, as the active ingredient is hydrolyzed and subsequently inactivated.**
- (d) Thoroughly clean the sprayer after use by flushing with water and detergent.
- (e) Allow 4 days between the application of Poast and any other chemical.
- (f) Control of grasses growing under drought, flooding or prolonged cool temperatures under 15°C. may be reduced or delayed. Escapes or re-tilling may occur under prolonged stress conditions. DO NOT APPLY ON GRASSES STRESSED LONGER THAN 20 DAYS DUE TO LACK OF MOISTURE AS UNSATISFACTORY CONTROL WILL RESULT.
- (g) Thorough pre-plant tillage operations are required where grass crops have grown the previous year.

**9. HOW IT WORKS:** Both a contact and a foliar absorbed systemically.

**10. EXPECTED RESULTS:** Weeds stop growing and slowly turn brown. With crop competition complete control takes 7 to 21 days.

**11. EFFECTS OF RAINFALL:** Within one hour after application may reduce effectiveness.

**12. MOVEMENT IN SOIL:** Not applicable.

**13. GRAZING AND CROPPING RESTRICTIONS:** Do not graze treated fields or harvest for feed prior to crop maturity. No restriction on succeeding crops.

**14. TOXICITY:** Very low acute mammalian toxicity; oral LD<sub>50</sub> rats = 2,500 mg/kg (formulation). Low toxicity to birds, fish and bees. Hazards to the environment are low because of rapid breakdown in soil. Causes moderate skin and eye irritation.

**15. PRECAUTIONS AND FIRST AID:** Wear standard protective clothing (see page 2) plus goggles to reduce skin and eye exposure. Use standard first aid measures (see page 3) to clean skin and eyes; get medical attention immediately for eyes. If swallowed, **do not induce vomiting**. Get immediate medical attention.

**16. STORAGE:** Store product in a cool, dry place.

### PRACTICAL USE CONSIDERATIONS

1. In wide row crops (25 cm or more in width) such as soybeans and sugar beets where the crop canopy may be slow to close, cultivation may be necessary to control annual grasses that emerge after treatment. Allow a minimum of 4 days between treatment and cultivation.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**PRIMEXTRA (metolachlor + atrazine)**  
Ciba Geigy

1. FORMULATIONS: Flowable - metolachlor - 300 g/L + atrazine - 190 g/L + related active triazines - 10 g/L - 10 L pack.
2. REGISTERED MIXES: Nitrogen fertilizer solutions may replace all or part of the water carrier. Dry granular phosphate fertilizers may be impregnated with Primextra.
3. CROPS: Corn (field, silage, sweet).
4. WEEDS CONTROLLED: Barnyard grass, foxtail (green and yellow) witchgrass, annual smartweeds, lamb's-quarters, purslane, pigweed (prostrate, redroot), ragweed, wild buckwheat, wild mustard.
5. WEEDS SUPPRESSED: None
6. WHEN USED: Spring applied - preplant incorporated or banded.
7. HOW TO APPLY:
  - With:** Ground equipment
  - Rate:** 2.7-3.4 L/ac (6.7-8.5 L/ha)
  - Cost:** \$7/L
  - Water Volume:** 60-120 L/ac (150-300 L/ha)
8. SPRAYING TIPS:
  1. Add chemical while filling tank with water - gently agitate while filling, mixing, spraying.
  2. Use metal filters and screens 50 mesh or larger.
  3. Dry granular fertilizer may be impregnated for preplant, incorporated application.
9. HOW IT WORKS: Absorbed by roots and inhibits photosynthesis.
10. EXPECTED RESULTS: Weeds die at germination or under dry conditions die-back soon after emergence.
11. EFFECT OF RAINFALL: Enhances results.
12. MOVEMENT IN SOIL: Negligible lateral movement.
13. GRAZING AND CROPPING RESTRICTIONS: Follow corn with corn only.
14. TOXICITY: Very low acute mammalian toxicity - oral LD<sub>50</sub> - rats - 3100 mg/kg; low toxicity to fish and birds. May cause severe skin irritation and perhaps eye injury.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) and goggles when using. Use standard first aid measures (see page 3) to clean skin and eyes. If swallowed, induce vomiting - get medical attention.
16. STORAGE: Dry heated storage preferred. If frozen warm to room temperature and agitate.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**PRIMATOL (atrazine)**  
Ciba Geigy

1. FORMULATIONS: 80% wettable powder - 25 kg pack  
Liquid 500 g/L atrazine - 10 L pack
2. REGISTERED MIXES: Primatol with diuron + simazine, 2,4-D, simazine, paraquat.
3. CROPS: Non-crop land only.
4. WEEDS CONTROLLED: Non-selective.
5. WEEDS SUPPRESSED: Horsetail, milkweed.
6. WHEN USED: April and May OR August to freeze-up.  
NOTE: Spring application can be extended into June, sometimes July, if soil moisture is plentiful, or paraquat is added.
7. HOW TO APPLY:  
**With:** High volume equipment.  
**Rate:** 8.9-18.2 L/ac (22-45 L/ha) (liquid) or 5.75-11.5 kg/ac (14.2-28.4 kg/ha) (WP)  
**Incorporation:** See "soil sterilants" page 4.
8. SPRAYING TIPS: See "soil sterilants" page 4.
9. HOW IT WORKS: Primatol is taken up mainly by roots and to a lesser degree through foliage.
10. EXPECTED RESULTS: Weeds fail to emerge or, die back soon after emergence.
11. EFFECTS OF RAINFALL: Moderate rainfall can enhance performance. Very heavy rainfall on sandy soils can cause leaching and thus a decrease in efficacy.
12. MOVEMENT IN SOIL: Low solubility, low leachability but there may be some physical movement, on sloping ground.
13. GRAZING AND CROPPING RESTRICTIONS: Not applicable.
14. TOXICITY: Very low acute mammalian toxicity - oral LD<sub>50</sub> - rats = 3,080 mg/kg (active ingredient). May cause eye irritation. Non toxic to fish and birds - may be toxic to bees. Do not spray on foraging bees.
15. PRECAUTIONS AND FIRST AID: Wear standard protective clothing (see page 2) including goggles. Use standard first aid measures (see page 3) to clean skin and eyes. If swallowed, induce vomiting, see a doctor.
16. STORAGE: In a dry location.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**REGNONE (diquat)**  
Chipman

1. FORMULATIONS: Water soluble solution, 200 g/L; 5 L container.
2. REGISTERED MIXES: Reglone + Agral 90 (surfactant). Mixing with other pesticides: Not recommended
3. CROPS: Rapeseed, flax, peas, sunflowers (all), mustard, potatoes, beans (red, kidney, white, soy, adzuki), alfalfa, bird's-foot trefoil, clover (red, white).
4. WEEDS CONTROLLED: Non-selective for green vegetation used for weed control and crop desiccation for harvest.
5. WEEDS SUPPRESSED: Not applicable
6. WHEN USED: For crop desiccation.

*Rapeseed* - By aircraft when 60-75% of the seeds have turned from green to brown. *Mustard* - By aircraft when 75% of the seeds have turned. *Flaxseed* - By aircraft when crop has reached 75% ball turn. *Sunflowers* - Apply by aircraft at 20-50% moisture. *Field or Dry Peas* - By aircraft when the crop is mature. Treatment will not mature peas but will kill green weeds in the crop. *Potato Vines* - Spray two weeks before harvest, by air or ground. *Alfalfa, Bird's-foot Trefoil, Red and White Clover grown for Seed* - By air no more than seven days prior to harvest. *Beans* (red, white, kidney, soy, adzuki) - Apply by ground or air when 80-90% of natural leaf defoliation of the bean plants has occurred. Treatment does not mature beans but removes green weeds.

7. HOW TO APPLY:

**With:** Aircraft or ground equipment. Booms on ground equipment must be set high enough to ensure proper coverage of the foliage.

**Rate:** *Rapeseed, Mustard* - light stands, maturing evenly and fields free from weeds, use 810 mL/ac (2.0 L/ha) in 20 L/ac (45 L/ha) water. Heavy stands on fields which contain weeds, use 1.1 L/ac (2.75 L/ha) in 20 L/ac (45 L/ha) of water. Add Agral 90 at 1 L/1,000 L of spray mixture. Do not straight combine Argentine varieties of rapeseed. They must be swathed three days after application, or severe shelling and pod drop occurs particularly in windy weather. Polish varieties may be straight combined.

*Sunflowers* - Apply at 600 mL/ac (1.5 L/ha) in 20 L (45 L/ha) of water. Add Agral 90 at 1 L/1,000 L of spray mixture.

*Flax* - light stands maturing evenly and the field is free from weeds. Use 600 mL/ac (1.5 L/ha) in 20 L/ac (45 L/ha) of water. Heavy or weedy stands, or fields with variation in growth, use 1.1 L/ac (2.7 L/ha) in 20 L/ac (45 L/ha) of clean water. Use Agral 90 at 1 L/1,000 L of spray mixture.

*Peas* - If green weeds are present use 1.1 L/ac (2.7 L/ha) in 20 L/ac (45 L/ha) of water. Use Agral 90 at 1 L/1,000 L of spray mixture.

*Alfalfa, Bird's-foot Trefoil, Red and White Clover Grown for Seed* - Use 810-1130 mL/ac (2-3.2 L/ha) in 90-180 L/ac (225-550 L/ha) of water. Use Agral 90 at 1 L/1,000 L of spray mixture.

*Beans* - Apply 810 mL/ac (2 L/ha) where the weed infestation is light to moderate. In moderate to heavy weed infestation, use 1.1 L/ac (2.75 L/ha). Use at least 120 L/ac (300 L/ha) of water. Use Agral 90 at 1 L/1,000 L of spray mixture.

**Cost:** \$12.00/L

**Water Volume:** Aircraft - minimum 8 L/ac (20 L/ha). Ground - 100-400 L/ac (250-1,000 L/ha)

**Pressure:** 275-400 kPa

**Ground Speed:** 9 km/h

**Nozzles:** All types.

8. SPRAYING TIPS:
  - (a) Higher spray volumes generally give better results.
  - (b) Applications made on cloudy days, during dull sunlight or just prior to or during periods of darkness will increase effectiveness.
  - (c) Muddy water will reduce effectiveness.
9. HOW IT WORKS: Reglone is absorbed by all leaf and stem surfaces, non-systemic. Interferes with photosynthesis.
10. EXPECTED RESULTS: Weeds: Fast and virtually complete top kill of annual weeds. Yellowing starts within a few hours of application. Desiccation of the plant will continue rapidly till death. Crops: Leaf kill will occur within a few days of application. Stem fall will take longer depending on the crop, but harvesting should normally commence within 7-14 days.
11. EFFECTS OF RAINFALL: No effect once the spray solution has dried.
12. MOVEMENT IN SOIL: Not applicable.
13. GRAZING AND CROPPING RESTRICTIONS: None.
14. TOXICITY: Has very high acute toxicity to mammals; oral LD<sub>50</sub> rats = 230 mg/kg. **Has the potential to cause cataracts, if eyes are constantly exposed.** May cause oral and nasal irritation shortly after use. Does not cause lung damage.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) plus a respirator, goggles and gloves when working with Reglone. Use standard first aid measures (see page 3) to clean skin and eyes; get medical attention for eyes immediately. If swallowed, induce vomiting and get medical attention immediately.
16. STORAGE: Heated storage is necessary.

**PRACTICAL USE CONSIDERATIONS**

1. Not yet registered for use on lentils, but works well at 600 mL/ac (1.5 L/ha) rate. Very useful on lentils grown on thin black and black soils where dry down is a problem.
2. No waiting period after use before straw may be fed to livestock.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

## ROUNDUP (glyphosate) Monsanto

1. FORMULATIONS: Water soluble solution 356 g/L; 1, 4 or 10 L container.
2. REGISTERED MIXES: *Zero Till*: Roundup + Torch + registered non-ionic surfactant. *Chemical Fallow*: Roundup + 2,4-D amine (or Banvel or Torch) + registered non-ionic surfactant.  
Mixing with other pesticides: Not recommended
3. CROPS: A non-selective herbicide used for pre-plant, pre-emergence or for spot application in certain crops.
4. WEEDS CONTROLLED:
  - (a) Annuals - bluegrass (annual) (9.0), buckwheat (wild) (6.7), downy brome, green foxtail (7.9), knotweed, kochia, lamb's-quarters (6.5), mustard, prickly lettuce, ragweed, Russian thistle, shepherd's-purse, smartweeds (annual), sow-thistle (annual), vetch, wild oats.
  - (b) Perennials - bindweed (field) (7.2), bluegrass (Canada, Kentucky) (9.0), bromegrass (smooth), Canada thistle (7.8), cattail, curled dock, hoary cress, milkweed, quackgrass, sow-thistle (perennial), toadflax (6.5), wormwood.
  - (c) Deciduous brush: birch, poplar, raspberry, snowberry, willow.
5. WEEDS SUPPRESSED: Many
6. WHEN USED: Canada thistle and quackgrass must be 20-25 cm + in height and up to the early heading or bud stage of growth. Other perennials at the early head or early bud stage: The low rate controls annual weeds 15 cm or less in height. Apply to deciduous brush in June, July, and August.  
Registered mixes are recommended for controlling annual weeds in chemical-fallow or zero-till situations.
7. HOW TO APPLY:  
**With:** Ground equipment only  
**Rate:** Perennial weeds: *Bindweed* (field) - 2.8-4.9 L/ac (7-12 L/ha). *Canada thistle* - 1.9-2.8 L/ac (4.75-7 L/ha); *Milkweed* (common) - 4.9 L/ac (12 L/ha); *Quackgrass* - 1.9-2.8 L/ac (4.7-7 L/ha); *Quackgrass* (fall only) - Post-harvest when regrowth has 3-4 leaves - 1.0 L/ac (2.5 L/ha). Other perennials - 2.8-4.9 L/ac (7-12 L/ha). *Annual Broadleaf*: 900-1400 mL/ac (2.2-3.5 L/ha). *Annual Grasses*: 300-400 mL/ac (750-1 L/ha). *Brush*: 4 L/ac (10 L/ha). *Minimum or zero tillage systems*: 450-575 mL/ac (1.1-1.4 L/ha)  
**Cost:** \$25/L  
**Water Volume:** Handgun and high volume equipment use coarse sprays only at 80-120 L/ac (200-300 L/ha). Boom equipment - 40-120 L/ac (100-300 L/ha) Chemical Fallow and Reduced Rates: 20-40 L/ac (50-100 L/ha)  
**Pressure:** 275 kPa  
**Ground Speed:** 9 km/h  
**Nozzles:** Flat fan nozzles for volumes 20-40 L/ac (50-100 L/ha) - flood jet type or flat fan for volumes above 40 L/ac (100 L/ha).  
8. SPRAYING TIPS: Quackgrass - Application 4 to 6 weeks after swathing. Treat only light to moderate infestations with the reduced rate (up to 150 shoots per square meter). Frost of -5°C will be tolerated by new shoots. Frost damage to growing shoots could reduce control and the field should be left untilled for spring treatment. Frost damage is evident by the drying of new shoots shortly after the frost.  
Apply in spring or fall to quackgrass that is in the 3-4 leaf stage (8-10 cm of new growth) for season long control - use 1 L/ac (2.5 L/ha). While not yet registered - control of Canada thistle in the rosette stage, applied in the fall on summerfallow using 400 mL/ac (1 L/ha) + registered non-ionic surfactant, may be expected.  
Allow 5 or more days after application before tillage.  
Apply in sunny, warm conditions.
9. HOW IT WORKS: Roundup is a systemic herbicide which moves from the foliage into the roots and kills the entire plant.
10. EXPECTED RESULTS: Wilting and yellowing of annual weeds occur within 2 to 4 days, perennial weeds require 7 to 10 days. Complete browning of above ground growth and deterioration of roots occurs. Cool or cloudy weather may slow the activity and delay visual effects.
11. EFFECTS OF RAINFALL: Rainfall within 6 hours after application may reduce effectiveness. Heavy rainfall within 2 hours after application may wash the chemical off the foliage and require retreatment.
12. MOVEMENT IN SOIL: Not applicable
13. GRAZING AND CROPPING RESTRICTIONS: Not applicable.
14. TOXICITY: Has very low acute mammalian toxicity; oral LD<sub>50</sub> rats = 4,320 mg/kg. Eye irritant. Non-toxic to birds, fish and bees.
15. PRECAUTIONS AND FIRST AID: Wear standard protective clothing (see page 2) and goggles to reduce skin and eye exposure. Use standard first aid measures (see page 3) to clean skin and eyes. If swallowed, induce vomiting. Get medical attention.  
**Do not use in galvanized steel or unlined steel tanks.**
16. STORAGE: Heated storage not required.

## PRACTICAL USE CONSIDERATIONS

1. Fall applications of Roundup may continue after frost as long as the target plants remain green. Do not spray after browning as results will be unsatisfactory.
2. The use of Roundup at less than recommended rates with either ammonium sulphate or surfactants is not recommended for Western Canada. Experimental work supporting reduced Roundup rates with additives was done in Great Britain but do not apply in Alberta.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**SENCOR (metribuzin)**  
Chemagro

1. FORMULATIONS: 500 Flowable 500 g/L; 5 L jugs, 4 jugs/case.  
750 water dispersable granule (sprayule).  
750 g active/kg; 3 kg jugs, 4 jugs/case.
2. REGISTERED MIXES: Sencor + Banvel - Cereals (except Klondike Barley). Sencor + 2,4-D amine - Cereals (except Klondike Barley). Sencor + Eptam - Potatoes. Sencor + MCPA amine - Cereals. Sencor + Target - Cereals. Sencor + Treflan - Fababeans, Triazine tolerant canola (see Spectrum).
3. CROPS: Spring wheat (8.5), barley (8.9), potatoes (8.6), lentils (7.8), fababeans (8.6), field peas, alfalfa and triazine tolerant canola. Underseeding: Do not underseed.
4. WEEDS CONTROLLED: Chickweed (8.1), common groundsel, corn spurry (7.1), hemp-nettle (8.4), henbit (8.0), lady's-thumb, lamb's quarters (8.4), mustard (ball, wild, wormseed) (8.0), night-flowering catchfly, redroot pigweed (7.4), Russian thistle (7.2), green smartweed (8.5), stinkweed (8.2), tartary buckwheat (5.3), volunteer rapeseed (non-triazine tolerant) (8.8). (Check label for rate for specific weeds).
5. WEEDS SUPPRESSED: Canada thistle and sow-thistle with the 2,4-D, MCPA and Banvel mixes.
6. WHEN USED:  
*Wheat and Barley* - Sencor alone - 2-5 leaf stage; Sencor + Banvel - 2-3 leaf stage of barley, (except Klondike) - 2-4 leaf stage of wheat; Sencor + 2,4-D amine - 3-5 leaf stage (except Klondike barley); Sencor + MCPA amine - 3-5 leaf stage; Sencor + Target - Barley - 2-3 leaf stage, Wheat - 2-5 leaf stage  
*Potatoes* - Sencor alone - before weeds are 4 cm high; Sencor + Eptam - pre-plant incorporated  
*Fababeans* - Sencor + Treflan - pre-plant incorporated  
*Lentils and Peas* - Sencor alone - Before vines are 15 cm long and after weeds have emerged but less than 5 cm.  
*Alfalfa (Grown under irrigation)* - Sencor - Apply to dormant established stands of alfalfa in the fall. Injury may occur to alfalfa if Sencor is applied earlier than 18 months after seeding.  
*Triazine Tolerant Canola* - Sencor alone before weeds are 5 cm high. Sencor + Treflan - pre-plant incorporated, fall or spring.
7. HOW TO APPLY: Do not tank mix with any other pesticide, wetting agent or surfactant. Do not apply within 3 days after periods of cool, wet or cloudy weather or to lentils past the recommended growth stage, else crop injury may occur. Do not apply more than once per season. Crop must be planted at least 5 cm below the soil surface.

**With:** Ground equipment

**Rate:** Barley (except Klondike) - 110-225 mL/ac (275-550 mL/ha) of 500 flowable alone or tank-mixed with 350-440 mL/ac (850 mL-1100 mL/ha) of MCPA or 2,4-D amine 500 or tank-mixed at 110-170 mL/ac (275-425 mL/ha) of Sencor with 110 mL/ac (275 mL/ha) of Banvel 400 or tank mixed at 400-600 mL/ac (1.0-1.5 L/ha) of Target. Klondike barley: 110-170 mL/ac (275-425 mL/ha) of 500 F or 110 mL/ac (275 mL/ha) of 500 F tank-mixed with MCPA amine. Do not apply Sencor plus Banvel or 2,4-D.

Wheat - 110-170 mL/ac (275-425 mL/ha) of 500 F alone or tank-mixed with 350-440 mL/ac (850-1100 mL/ha) of MCPA or 2,4-D amine 500 or tank-mixed with 110 mL/ac (275 mL/ha) of Banvel 400 or tank mixed with 400-600 mL/ac (1.0-1.5 L/ha) of Target.

Lentils - 170 mL/ac (425 mL/ha) of 500 F applied as a post-emergence broadcast spray in at least 70 L/ac (170 L/ha) of water.

Peas - 170-225 mL/ac (425-550 mL/ha) of 500 F applied as a post-emergence broadcast spray in at least 70 L/ac (170 L/ha) of water.

Potatoes - 225 mL/ac (550 mL/ha) of 500 F applied early post-emergence.

— Under irrigation, 225-910 mL/ac (550 ml-2.2 L/ha) (maximum) applied early post-emergence.

— Irrigation or dryland, 225-345 mL/ac (550-850 mL/ha) (maximum) of 500 F tank-mixed with 1.7-2.2 L/ac (4.2-5.5 L/ha) of Eptam 800 as a pre-plant incorporated treatment.

Fababeans

Spring Application - 325-350 mL/ac (550-850 L/ha) of 500 F tank-mixed with 600-800 mL/ac (1.5-2.0 L/ha) of Treflan 545 EC as a pre-plant incorporated treatment.

Fall Application - 340 mL/ac (850 mL/ha) of 500 F tank-mixed with 800-1050 mL/ac (2.0-2.6 L/ha) of Treflan 545 EC as a pre-plant incorporated treatment.

Alfalfa (Under irrigation only) - 910 mL/ac (2.2 L/ha) of 500 F as a dormant fall application.

Triazine Tolerant Canola - 170 mL/ac (425 mL/ha) of 500 F applied as a post-emergent broadcast spray in at least 70 L/ac (170 L/ha) of water.

Spring Application: On light soils, with less than 6% O.M., 175-225 mL/ac (425-550 mL/ha) of 500 F + 600 mL/ac (1.5 L/ha) of Treflan. On medium or heavy soils, 6-15% O.M., 225-350 mL/ac (550-850 mL/ha) of 500 F + 800-1100 mL/ac (2.0-2.6 L/ha) of Treflan 545 EC as a pre-plant incorporated treatment.

Fall Application: On light soils, with less than 6% O.M., 225-285 mL/ac (550-770 mL/ha) of 500 F + 800 mL/ac (2.0 L/ha) of Treflan. On medium or heavy soils, 6-15% O.M., 285-350 mL/ac (700-850 mL/ha) of 500 F + 1.1-1.3 L/ac (2.6-3.0 L/ha) of Treflan 545 EC as a pre-plant incorporated treatment.

**Cost:** Sencor 500F - \$37/L. Sencor 75 DF - \$58/kg.

**Water Volume:** 40 L/ac (100 L/ha) - except 70 L/ac (170 L/ha) for lentils, peas and post emergent on triazine tolerant canola.

**Incorporation:** For Sencor + Eptam on potatoes refer to Eptam. For Sencor + Treflan on fababeans and triazine tolerant canola refer to Treflan and Spectrum.

**Pressure:** 200-275 kPa

**Ground Speed:** 9 km/h

**Nozzles:** All standard or low pressure nozzles delivering 40 L/ac (100 L/ha).

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

8. SPRAYING TIPS: Allow a 4-5 day interval between the application of Sencor and post-emergent wild oat herbicides. Weed control may be reduced if Sencor is applied later than the 5 leaf stage of crop. Allow 4-5 days after frost for crop to recover before applying Sencor. Crop may be sprayed when wet with dew. Lentils and Peas - apply only once per crop season. Crop must be planted at least 5 cm below the soil surface. Tilt nozzles 45° forward for better spray penetration.

9. HOW IT WORKS: A systemic herbicide absorbed by leaves and roots and translocated to new growth. Inhibits photosynthesis and the weed turns brown and dies.

10. EXPECTED RESULTS:

*Broad-leaf Weeds:* Initial yellowing 5-7 days after application, weeds turn brown and die within 14-16 days. Sencor is active in the soil for a short period and can control new shallow-rooted germinants, like chickweed.

*Crop:* Under certain environmental conditions, like extremely hot weather or frost that occurs within 1-2 days of application, the crop will show some yellowing and slight reduction in height. Discolouration disappears in 7-10 days. On Klondike, Johnston and Leduc barley varieties, temporary lightening in crop colour and reduction in crop height may occur.

Lentils and peas provide little competition against weed growth due to their low growth habit. Under heavy weed infestations or lush growth control may be poor.

11. EFFECTS OF RAINFALL: Rainfall within 6 hours after application may reduce weed control.

12. MOVEMENT IN SOIL: Little leaching occurs in soils with high organic matter.

13. GRAZING AND CROPPING RESTRICTIONS:

- Do not graze or feed treated crop to livestock within 30 days of application (lentils and peas - 70 days)
- Do not harvest for grain within 60 days of application (lentils and peas - 70 days, TTC - 75 days).

14. TOXICITY: Low acute mammalian toxicity; oral LD<sub>50</sub> rat = 1,100 mg/kg Slightly toxic to fish and birds.

15. PRECAUTIONS AND FIRST AID: Wear standard protective clothing (see page 2) when working with the product to avoid exposure. Use standard first aid measures (see page 3) to clean skin and eyes. Induce vomiting if swallowed.

16. STORAGE: No damage by freezing but avoid large temperature fluctuations. Store in a cool dry place.

## PRACTICAL USE CONSIDERATIONS

1. Shake the Sencor 500 Flowable container well before adding to the sprayer tank.
2. Initial studies have shown that there can be more injury to barley when there is shading for 12 hours immediately after spraying Sencor. Thus, try to avoid spraying Sencor in the late evening or on a cloudy day.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**SIMMAPRIM (simazine)**  
Ciba Geigy

1. FORMULATIONS: Wettable powder - 80% - 25 kg pack.
2. REGISTERED MIXES: Simmaprim with amitrol, atrazine, atrazine + diuron, paraquat, sodium chlorate, and sodium metaborate.
3. CROPS: Total weed control and bare ground maintenance on non-crop land.
4. WEEDS CONTROLLED: Most annual and perennial broad-leaf weeds and grasses. Horsetail, milkweed and sedges may require more than one treatment.
5. WEEDS SUPPRESSED: Not applicable
6. WHEN USED: Apply before or during weed emergence. Can be applied in fall before freeze up for control of perennial weeds.

7. HOW TO APPLY:

**With:** High volume application equipment.

**Rate:** 5.7-11.5 kg/ac (14.2-28.4 kg/ha)

**Incorporation:** See "soil sterilants" page 4.

8. SPRAYING TIPS: See "soil sterilants" page 4.
9. HOW IT WORKS: Absorbed through roots only.
10. EXPECTED RESULTS: Failure of weeds to emerge or, depending on weather conditions, weeds may die back after emergence.
11. EFFECTS OF RAINFALL: Average rainfall can enhance performance.
12. MOVEMENT IN SOIL: Movement in the soil is negligible.
13. GRAZING AND CROPPING RESTRICTIONS: Not applicable - for use on non-crop land.
14. TOXICITY: Very low acute mammalian toxicity - oral LD<sub>50</sub> - rats - 5,000 mg/kg. May be irritating to eyes and cause dermatitis.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) and goggles to reduce skin and eye exposure. Use standard first aid measures (see page 3) immediately if skin and eyes are contaminated.
16. STORAGE: Store in dry area. Heating not required.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**SINBAR (terbacil)**  
DuPont

1. FORMULATIONS: Wettable powder - 80% - 2 kg pack.
2. REGISTERED MIXES: None.
3. CROPS: Alfalfa (forage and seed) (8.6). After crop established for one growing season.
4. WEEDS CONTROLLED: Annual bluegrass (8.6), annual sow thistle (8.4), barnyard grass (7.2), common chickweed (8.6), common ragweed, dandelion (6.5), downy brome, green foxtail (7.3), henbit, lamb's-quarters (8.9), perennial ryegrass, prickly lettuce, redroot pigweed (8.0), shepherd's-purse (9.0), stinkweed (9.0), wild barley (7.5), wild mustard.
5. WEEDS SUPPRESSED: Quackgrass, dandelion (less than two years old).
6. WHEN USED: Preferably after alfalfa becomes dormant in fall or before growth begins in spring.
7. HOW TO APPLY:

**With:** Ground equipment.

**Rate:** 285-610 g/ac (0.7-1.5 kg/ha) - lower rate on light soils, higher rate on heavier soils.

**Cost:** \$61/kg

**Water Volume:** 80 L/ac (200 L/ha)

**Incorporation:** Not applicable.

**Pressure:** 275 kPa

**Ground Speed:** 9 km/h

**Nozzles:** All standard nozzles delivering 80 L/ac.
8. SPRAYING TIPS:
  - (a) Use metal filters, line strainers and screens no finer than 50 mesh.
  - (b) Continuous tank agitation required.
  - (c) To reduce crop injury, do not use on soils with less than 1% organic matter.
9. HOW IT WORKS: Absorbed by roots and inhibits photosynthesis.
10. EXPECTED RESULTS:

**Weeds:** Kills germinating weeds. Any that emerge will yellow and die.  
**Crop:** No effect on alfalfa if it is dormant at time of application.  
**Conditions under which poor results may be expected:** Too little moisture for activation, uneven coverage, rate too low for soil type.
11. EFFECT OF RAINFALL: Moderate rainfall is desirable.
12. MOVEMENT IN SOIL: Some movement under light soil and high moisture conditions.
13. GRAZING AND CROPPING RESTRICTIONS:

**Drift:** Most crops sensitive.  
**Grazing Restrictions:** None.  
**Succeeding Crops:** Within two years of last treatment seed no other crop.
14. TOXICITY: Very low acute mammalian toxicity - oral LD<sub>50</sub> - rats - 5,000 mg/kg, non-toxic to bees.
15. PRECAUTIONS, FIRST AID: Wear standard protective gear (see page 2). Use standard first aid measures (see page 3) to clean skin and eyes.
16. STORAGE: Cool, dry storage.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**PRINCEP/SIMADEX (simazine)**  
Ciba Geigy

1. FORMULATIONS: Princep 4G (granular) - 3.8% simazine + .2% related triazines - 4.5 kg pack.  
Princep Nine-T (water dispersible granule) - 87.6% simazine + 2.4% related triazines - 4.5 kg pack.  
Simadex 80W (wettable powder) - 80% simazine - 2 kg.  
Simadex Flowable (liquid) - 500 g/L simazine - 5 L.
2. REGISTERED MIXES: None
3. CROPS: Apples, pears, strawberries, loganberries, raspberries, high bush blueberries, blackberries, shelterbelts, established woody ornamentals and nursery stock, forest and Christmas tree plantings, established alfalfa, established bird's-foot trefoil, corn (field and sweet), and asparagus.  
OTHER USES: Aquatic weed control (restricted use) and total vegetation control on farms and non-crop land.
4. WEEDS CONTROLLED: Princep and Simadex control both broad-leaf and grassy weeds, including seedling perennial weeds.
5. WEEDS SUPPRESSED: None
6. WHEN USED: Princep and Simadex should be used prior to or during weed emergence and may be applied in either the spring or fall, prior to freeze-up.
7. HOW TO APPLY:

**With:** Ground equipment as standard farm sprayer and a Cyclone spreader or other mechanical applicator when using the granular.

**Rate:**

**Princep 4G:**

Established nursery stock: 22.0-34.0 kg/ac (55-85 kg/ha) in fall or spring. Shelterbelts: 44.0-70.0 kg/ac (110-175 kg/ha) in the fall. Forest and Christmas trees: 44.0-70.0 kg/ac (110-175 kg/ha). Total vegetation control on farms (spot treatment) 5.5-7.5 kg/100 m<sup>2</sup>. Established asparagus: 1.0-1.5 kg/ac. Shelterbelts: 2.0-3.0 kg/ac (5-7.5 kg/ha). Established bird's-foot trefoil and established alfalfa: 445 g/ac (1.1 kg/ha) (fall treatment only). Corn: 600-1000 g/ac (1.5-2.5 kg/ha).

**Simadex 80W and Simadex Flowable:**

Established raspberries: 900-1000 g/ac (2.25-2.75 kg/ha) 80W, 1.5-1.75 L/ac (3.6-4.5 L/ha). Flowable. Strawberries: new plantings established at least six weeks, 900 g/ac (2.25 kg/ha) 80W, 1.5 L/ac (3.6 L/ha) Flowable. Established asparagus, woody ornamentals and nursery stock - established one year or more: 1-1.75 kg/ac (2.75-4.25 kg/ha) 80W, 1.8-2.7 L/ac (4.5-6.7 L/ha) Flowable. Shelterbelts, established one growing season or more - Forest and Christmas tree plantings - 2 year stock or older - 2.5-3.5 kg/ac (5.5-8.5 kg/ha) 80 W or 3.5-5.5 L/ac (9.0-13.5 L/ha) flowable. Established bird's-foot trefoil: 600 g/ac (1.5 kg/ha) 80W, 890 mL/ac (2.2 L/ha) Flowable (fall treatment only). Corn: 890-1100 mL/ac (2-2.75 kg/ha) 80W, 1.25-3.25 L/ac (3.2-8.0 L/ha) Flowable. Industrial: for total weed control and bare ground maintenance on non-crop land, - 11-27.5 kg/ha - low rate for weed seedlings, high for well established perennials. Aquatic vegetation control: restricted uses -depending on type of weeds, water flow - per 500,000 L of water 250-1,000 gms.

**Water Volume:** 120 L/ac (300 L/ha) for Princep Nine-T and Simadex Flowable except 200 L/ac (500 L/ha) for shelterbelts. 140 L/ac (350 L/ha) for Simadex 80W except 220 L/ac (550 L/ha) for shelterbelts.

**Incorporation:** In corn, Princep and Simadex may be applied one week before seeding and incorporated to a depth of 2.5 cm.

**Ground Speed:** Dependent on crop and type of application.

**Nozzles:** Standard spray nozzles designed to deliver recommended rates at low to medium pressure ensuring good coverage.

**Pressure:** 275 kPa

8. SPRAYING TIPS: Princep Nine-T - Gentle agitation required during mixing and spraying. Use nozzle screens of 50 mesh or larger. After any break in the spray application, agitate thoroughly. See "soil sterilants" page 4 - for this use.
9. HOW IT WORKS: Princep and Simadex act through the roots of germinating weeds and inhibit photosynthesis.
10. EXPECTED RESULTS: Weed free ground.
11. EFFECTS OF RAINFALL: Negligible
12. MOVEMENT IN SOIL: Very little movement is possible on clay soil but on sandy ground with high rainfall some leaching may occur.
13. GRAZING AND CROPPING RESTRICTIONS: Allow 30 days between application and grazing of dairy, beef cattle, and sheep and 60 days between application and cutting for hay. After spraying with Princep Nine-T, Simadex 80W or Simadex Flowable do not plant any crop in the treated area in the same year except corn.
14. TOXICITY: Very low acute mammalian toxicity - oral LD<sub>50</sub> - rats - 5,000 mg/kg. May be irritating to eyes and cause dermatitis.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) and goggles when using. Use standard first aid measures (see page 3) immediately to clean skin and eyes.
16. STORAGE: Store in dry area, heating not required.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

## SODIUM TCA Hoechst

1. FORMULATIONS: An 85% granule in 25 kg bags.
2. REGISTERED MIXES: Sodium TCA + 2,4-D amine, MCPA amine, MCPA sodium salt, Buctril M.
3. CROPS: Flax (8.6), canola (8.7), barley (9.0), oats, field peas (7.0), sugar beets, red beets, cabbage, cauliflower, non-crop land.
4. WEEDS CONTROLLED: Green foxtail (6.9), yellow foxtail (6.9), spruce, balsam, fir, pine.
5. WEEDS SUPPRESSED: Quackgrass, Kentucky blue, smooth brome grass.
6. WHEN USED: Foxtail - 1 to 3 leaf stage; Quackgrass - no stage limitation. Oats, barley, canola, flax - 2-4 leaf. Field peas - 10-20 cm tall. Sugar beets - pre or post-emergent before 4 leaf. Red beets - pre-emergent. Cabbage and cauliflower - pre-emergent or directed post-emergent.
7. HOW TO APPLY:

**With:** Ground equipment

**Rate:** Flax, rapeseed, field peas - 1.8 kg/ac (4.5 kg/ha)  
Barley - 500 g/ac (1.2 kg/ha)  
Oats - 500 g/ac - 1.1 kg/ac (1.2-2.75 kg/ha)  
Sugar beets - 1.8 kg/ac (4.5 kg/ha) post-emergent  
- 2.5-4 kg/ac (6.2-10 kg/ha) pre-emergent  
Red beets - 2.5-4 kg/ac (6.2-10 kg/ha)

**Non-Selective:**

- Quackgrass - 44.5 kg/ac (110 kg/ha)
- Quackgrass patches (undisturbed) - 100-125 g/10 m<sup>2</sup>
- Quackgrass patches (with cultivation) - 75-100 g/10 m<sup>2</sup>
- Kentucky blue, smooth brome grass suppression - 5-7 kg/ac (12.5-17.5 kg/ha)
- Spruce, balsam fir and pine - 20-25 kg/1000 L of water
- Pavement maintenance - 2.5 kg/100 m<sup>2</sup>

**Water Volume:** 40 L/ac (100 L/ha) in all cases except for woody plant control. Apply to point of run-off for spruce, fir and pines.

**Incorporation:** For quackgrass cultivate or disc thoroughly after application.

**Pressure:** 275 kPa

**Ground Speed:** 8-9 km/h

**Nozzles:** Flat fan nozzles, use minimum 50 mesh screens.

**8. SPRAYING TIPS:**

- (a) Flush sprayer thoroughly after each use to prevent corrosion.
- (b) Agitate to dissolve TCA.
- (c) Stainless steel nozzles are recommended due to corrosiveness.
- (d) When mixing spray, put 10 L + water in the tank for each kg of TCA.
- (e) Ensure that TCA is dissolved before adding another herbicide.
- (f) Plant barley and oats at least 5 cm deep to avoid crop injury.

**9. HOW IT WORKS:** Absorbed more readily through roots than foliage. Precipitates proteins in the plants and disrupts the membranes.

**10. EXPECTED RESULTS:** Chlorosis, then browning of the leaf tips, growth retardation and eventual death.

Poor results may be expected if the soil is dry at application time and for a 2-3 week period after or there is inadequate mixing.

**11. EFFECTS OF RAINFALL:** A light rain after application is beneficial for activation. Heavy rain may wash TCA off foliage.

**12. MOVEMENT IN SOIL:** Movement is greater in light, sandy soils.

**13. GRAZING AND CROPPING RESTRICTIONS:** *Grazing restrictions:* Do not feed tops of sugar or red beets to livestock. Do not allow animals to graze treated areas. Do not contaminate water bodies.

**14. TOXICITY:** Has very low acute mammalian toxicity; oral LD<sub>50</sub> = 3,320 mg/kg. Non-toxic to birds and fish. Skin and eye irritant.

**15. PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page 2) plus goggles and gloves to reduce exposure. Use standard first aid measures (see page 3) to clean skin and eyes; get medical attention.

**16. STORAGE:** Dry storage, no effect from freezing. A minimum of 2 years shelf life.

## PRACTICAL USE CONSIDERATIONS

1. This is an old product and for many of the uses there are easier to use and more effective products available at somewhat higher cost.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**SPECTRUM (metribuzin + trifluralin tank mix)**  
Chemagro and Elanco

1. FORMULATIONS: One 4.8 L jug of Sencor 500 F flowable 500 g/L packed with two 8.5 L jugs of Treflan 545 EC emulsifiable concentrate 545 g/L for tank mixing.
2. REGISTERED MIXES: Sencor 500 F + Treflan 545 EC.
3. CROPS: Triazine Tolerant Canola (8.4) (Variety OAC Triton pedigreed seed only). NON-TRIAZINE TOLERANT RAPESEED WILL BE KILLED BY THIS COMBINATION. Do not underseed.
4. WEEDS CONTROLLED: Wild mustard (7.6), stinkweed (8.7), green smartweed (8.7), lady's-thumb (6.7), volunteer rapeseed (non-triazine tolerant) (6.9), shepherd's-purse, hemp-nettle (8.9), lamb's-quarters (8.0), wild buckwheat (7.4), redroot pigweed (8.5), chickweed, knotweed, Russian thistle, purslane, cow cockle, wild oats (8.3), foxtail (green (8.5) and yellow), Persian darnel, annual bluegrass, barnyard grass, bromegrass, downy brome.
5. WEEDS SUPPRESSED: None.
6. WHEN USED:
  - Spring application: cultivate to destroy existing weeds and apply prior to planting crop in the spring.
  - Fall application: apply in the fall (September 1 to freeze-up).**NOTE:** Fall incorporation should be discouraged wherever soil drifting is a problem.
7. HOW TO APPLY: With ground equipment.

**Rate:** Table below.

SOIL CHARACTERISTICS	SPRING APPLICATION CHEMICAL RATE		FALL APPLICATION CHEMICAL RATE	
	Treflan 545 EC	+ Sencor 500 F	Treflan 545 EC	+ Sencor 500 F
Light Soils				
2-3% Organic matter	600 mL/ac (1.5 L/ha)	+ 175 mL/ac (425 mL/ha)	800 mL/ac (2.0 L/ha)	+ 225 mL/ac (550 mL/ha)
3-6% Organic matter	600 mL/ac (1.5 L/ha)	+ 225 mL/ac (550 mL/ha)	800 mL/ac (2.0 L/ha)	+ 285 mL/ac (700 mL/ha)
Medium or heavy soils	800-1100 mL/ac* (2.0-2.6 L/ha)	+ 225-350 mL/ac (550-850 mL/ha)	1.1-1.3 L/ac** (2.6-3.0 L/ha)	+ 285-350 mL/ac (700-850 mL/ha)
6-10% Organic matter				
10-15% Organic matter	800-1100 mL/ac* (2.0-2.6 L/ha)	+ 350 mL/ac (850 mL/ha)	1.1-1.3 L/ac** (2.6-3.0 L/ha)	+ 350 mL/ac (850 mL/ha)

\* Use the 1.1 L/ac (2.6 L/ha) rate of Treflan 545 EC when there is a heavy wild oat infestation.

\*\* Use the 1.3 L/ac rate of Treflan 545 EC when there is a heavy wild oat infestation.

**NOTE:** Mix the Sencor in the tank before adding the Treflan. Continually agitate until all the mixture is sprayed. Do not allow the sprayer to stand without agitation.

**Cost:** Sencor 500F - \$37/L. Treflan 545 EC - \$13/L.

**Water Volume:** Minimum of 40 L/ac (100 L/ha)

**Incorporation:** Apply to the soil and incorporate in the same operation, if possible, within 24 hours after application. Work twice in different directions. Use a tandem disc, discer or vibrashank type cultivator to cut 8-10 cm deep. Operate disc implements at 7-10 km/h and cultivators at km/h.

**Pressure:** 275 kPa

**Nozzles:** Nozzles that will apply 40 L/ac (100 L/ha) and equipped with 50 mesh screen.

**8. SPRAYING TIPS:**

Cultivate to destroy existing weeds before application.

When applying to stubble fields, chop and thoroughly mix crop residues into soil to a depth of 10-15 cm. Disc type implements provide the best results.

To avoid concentrating wild oat seeds below the treated layer, and causing soil erosion, do not plow (moldboard) land prior to application.

Do not use on soils with less than 2% or more than 15% organic matter.

On variable soils with light sandy areas, some injury may occur on the sandy areas if the rate used is for the heavier soil type.

On soils with 10% organic matter and higher, broadleaf weed control may not be adequate.

Do not apply to wet soils or soils subjected to periods of flooding.

Do not incorporate with a field cultivator when the soil is crusted, lumpy or too wet for good mixing action.

Triazine Tolerant Canola is sensitive to deep seeding so seedbed should be shallowly tilled and packed just prior to seeding in the spring to ensure a firm seedbed and accurate depth of planting.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**SPIKE (tebuthiuron)**  
Elanco

1. FORMULATIONS: 80% wettable powder - 2 or 20 kg.  
5% granular - 7 kg or 20 kg
2. REGISTERED MIXES: None  
Mix restrictions: Not applicable  
Mixing with other pesticides: Not recommended
3. CROPS: Non-cropland only.
4. WEEDS CONTROLLED: Controls all weeds.
5. WEEDS SUPPRESSED: Not applicable
6. WHEN USED: Use throughout the growing season and up to September 15th. Best if applied early in spring.
7. HOW TO APPLY:

**A) Spike 5G**

**With:** Shaker box or granular spreader.

**Rate:** 44.5-91.0 kg/ac (110-225 kg/ha) Apply the higher rates for deep-rooted perennials and for greater residual effect.

**Incorporation:** See "Soil Sterilants" page 4.

**B) Spike 80WP**

**With:** Ground spray equipment

**Rate:** 2.2-4.5 kg/ac (5.5-11 kg/ha). Use higher rates for deep rooted perennial weeds, and for longer term weed control.

**Water Volume:** See "Soil Sterilants" page 4.

8. SPRAYING TIPS: See "Soil Sterilants" page 4.
9. HOW IT WORKS: Requires rainfall to move into root zone. Absorbed by roots and inhibits photosynthesis.
10. EXPECTED RESULTS: Vegetation will turn brown and die. A complete kill is expected after one growing season. Duration of control will depend upon the amount of chemical applied, soil-type and environmental conditions.  
Poor results may be expected from inadequate application rate or application onto frozen ground.
11. EFFECTS OF RAINFALL: Rainfall will activate product, by carrying into the root zone.
12. MOVEMENT IN THE SOIL: Once moved into the soil by rainfall, will leach vertically with time.
13. GRAZING AND CROPPING RESTRICTIONS: Spike is non-selective residual herbicide, only used on non-cropland.
14. TOXICITY: Low acute mammalian toxicity. Oral LD<sub>50</sub> - rats = 644 mg/kg. Slightly toxic to fish and birds.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). Use standard first aid measures (see page 3) in case of severe skin or eye exposure.
16. STORAGE: Store in a dry place.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

9. HOW IT WORKS: See Treflan and Sencor.
10. EXPECTED RESULTS: See Treflan and Sencor.

*Crop:* Only for Triazine Tolerant canola. Stress such as disease, cold, deep planting, excessive moisture, high salts or drought may weaken canola seedlings and increase the possibility of damage. Temporary lightening on the margins of cotyledons and a slight delay in crop development may occur.
11. EFFECTS OF RAINFALL: Rainfall does not affect Treflan activity once incorporated. Sencor can be leached in sandy soils.
12. MOVEMENT IN SOIL: Treflan is not leached in the soil but Sencor can be leached in soils with low clay and/or organic matter.
13. GRAZING AND CROPPING RESTRICTIONS: Do not graze or feed treated crop within 30 days of application. Do not harvest for grain. Succeeding Crops: Vegetable crops and rapeseed (Non-triazine Tolerant) are sensitive to Sencor and may be injured if planted in Sencor treated soil in the application year and the next. After harvest, tillage that provide thorough mixing of the soil may reduce the chance of injury to succeeding crops. As a precaution oats, sugar beets and small-seeded annual grasses such as timothy, canary seed and creeping red fescue, should not be grown in rotation following a Treflan treated crop. Drought conditions in the year of a Treflan treated crop may result in higher levels of Treflan carry-over into the next year. To reduce wheat injury seed less than 7 cm into warm moist seedbed.
14. TOXICITY: See Treflan and Sencor.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). Use standard first aid methods (see page 3) to clean skin and eyes. If swallowed - do not induce vomiting - get medical attention.
16. STORAGE: See Treflan and Sencor.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**STAMPEDE CM (propanil + MCPA)**  
Rohm and Haas

1. FORMULATIONS: Emulsifiable concentrate: 360 g/L propanil + 100 g/L low volatile MCPA ester, 22.7 L container.
2. REGISTERED MIXES: None
3. CROPS: Spring wheat, durum wheat (8.7), barley (8.6), oats (8.9), and flax (8.4).  
*Underseeding:* Not recommended
4. WEEDS CONTROLLED: Annual smartweeds (8.6), bluebur (7.8), buckwheat (tartary (8.6), wild (8.4)), flixweed (7.4), foxtail (green, yellow) (8.6), lamb's-quarters (8.8), kochia (6.7), redroot pigweed (8.8), shepherd's-purse (rosette) (9.0), stinkweed (rosette) (8.7), volunteer rapeseed (8.8), wild mustard (8.8).
5. WEEDS SUPPRESSED: None
6. WHEN APPLIED: Apply at the 3-4 leaf stage of green foxtail (under 2.5 cm in height). Under dry conditions (soil moisture is deeper than 5 cm) apply when green foxtail is at the 2-3 leaf stage. Apply at 3-4 leaf of broadleaf weeds and 1-4 leaf of smartweed. Cereal crops must be at the 2-5 leaf stage and flax must be between 5 and 12 cm in height. Do not spray flax when temperatures exceed 30°C.
7. HOW TO APPLY:

**With:** Ground Equipment: field sprayers or floater-type equipment.

**Rate:** 1.1 L/ac (2.75 L/ha).

**Cost:** \$8/L

**Water Volume:** Field sprayers - 40 L/ac (100 L/ha). Floater type equipment - 60 L/ac (150 L/ha)

**Pressure:** 275 kPa

**Ground Speed:** 8 km/h field sprayers, 20 km/h or less for floaters

**Nozzles:** Only flat fan nozzles capable of delivering 40 L/ac (100 L/ha) are recommended with regular spray equipment.

**Floaters:** Flood nozzles can be used.
8. SPRAYING TIPS:
  - (a) Mixing Procedures: Fill spray tank with half the required amount of water. Add Stampede CM, engage agitator and add remainder of water. Water used should be 10°C or warmer. Spray Stampede CM within 6 hours of mixing.
  - (b) A 3 day interval is required before or after an application of Stampede CM and another herbicide. If an insecticide treatment is required, use Furadan, and wait a minimum of 5 days after Stampede CM application in wheat and 10 days in barley. For Dimethoate (Cyon) or Malathion allow a minimum interval of 14 days. Do not apply Stampede CM in fields to which Atrazine has been applied during the previous two years. Crops grown from seed treated with dual purpose (fungicide/insecticide) seed dressings may be treated with Stampede CM.
  - (c) Long term crop injury may occur if applied to crop under severe stress or if frost is expected within 24 hours.
  - (d) Under hot, dry and low relative humidity conditions spray during early morning or evening.
  - (e) Apply Stampede CM when temperatures are expected to exceed 10°C.
  - (f) Do NOT apply to cereals after the 5-leaf stage.
9. HOW IT WORKS: Rapidly absorbed by foliage to cause breakdown of cell walls and cellular metabolism. The MCPA component causes phenoxy-specific symptoms. Activity is essentially contact, and thorough spray coverage is necessary for optimum weed control. Weeds become tolerant beyond the 4 leaf stage as well as under stress conditions.
10. EXPECTED RESULTS: Within 3-5 days, weeds turn brown and have a "burnt off" or dried out appearance. Weeds past the recommended stage will show extensive desiccation, but some green tissue remains and new growth may be generated enough to recover. Weeds emerging after spraying are unaffected.  
*Crops:* Temporary yellowing, and leaf tip burn will usually be more noticeable in barley, oats and flax than wheat. These effects disappear 10-14 days after treatment. New growth develops normally and yields are not reduced. Applied under extreme stress conditions, Stampede CM may cause a slight delay in crop maturity, and some suppression of growth in flax. This may be offset by increased yield due to weed control.
11. EFFECTS OF RAINFALL: Rainfall 1 hour after treatment will not affect performance.
12. MOVEMENT IN SOIL: Not applicable
13. GRAZING AND CROPPING RESTRICTIONS: None.  
*Drift:* Danger is low; MCPA has a low volatility.
14. TOXICITY: Has very low acute mammalian toxicity; oral LD<sub>50</sub> rats = 1,950 mg/kg. Propanil has potential to cause chlorachne - a skin disease in man following prolonged exposure.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) to reduce skin exposure since propanil can cause skin problems. Use standard first aid measures (see page 3) to clean skin and eyes that are heavily contaminated. If swallowed, do not induce vomiting. Symptoms of poisoning may be giddiness, intoxication and headache. Get medical attention.
16. STORAGE: Heated storage is not required. If frozen, warm and agitate thoroughly to redissolve crystals.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**SWEEP (paraquat)**  
**Chipman**

1. FORMULATIONS: Water soluble solution 250 g/L; 20 L container.
2. REGISTERED MIXES: With bromoxynil + MCPA, dicamba + 2,4-D, Lorox + MCPA, 2,4-D, MCPA.  
Mix restrictions: With amine formulations use immediately.  
Mixing with other pesticides: Not applicable.
3. CROPS: Summerfallow  
Underseeding: Not applicable
4. WEEDS CONTROLLED: Annual grasses and annual broad-leaf weeds when tank-mixed with broad-leaf herbicide.
5. WEEDS SUPPRESSED: Most perennial weeds
6. WHEN USED: At the 2-4 leaf stage of annual weeds.
7. HOW TO APPLY:  
**With:** Ground equipment  
**Rate:** 910 mL/ac (2.25 L/ha) for annual grass control.  
**Cost:** \$9/L  
**Water Volume:** 40 L/ac (100 L/ha). Use higher volumes when foliage is dense or weeds are in the 4 leaf stage.  
**Pressure:** 300 kPa  
**Ground Speed:** 9 km/h  
**Nozzles:** All standard nozzles.
8. SPRAYING TIPS:
  - (a) Apply Sweep + Lorox + MCPA mix only once per year in spring.
  - (b) Use very clean water as muddy water will inactivate chemical.
  - (c) Applications made on cloudy days, during dull sunlight or periods of darkness will generally increase the effectiveness.
  - (d) Do not apply with mist blowers.
  - (e) Thoroughly wash equipment after spraying.
9. HOW IT WORKS: A contact herbicide absorbed by leaves and stems. Interferes with photosynthesis and causes yellowing and eventual death.
10. EXPECTED RESULTS:  
Weeds: Sweep provides immediate, fast and virtually complete annual grass control. Repeat applications will be necessary when new weeds emerge. Yellowing occurs in a few hours, followed by rapid desiccation and later death. When tank-mixed with a broad-leaf herbicide, most annual weeds will be controlled. Thorough coverage of weeds is essential.  
*Crop:* Not applicable.
11. EFFECTS OF RAINFALL: No effect once the spray solution has dried on the plant tissue.
12. MOVEMENT IN SOIL: None.
13. GRAZING AND CROPPING RESTRICTIONS: None.
14. TOXICITY: Has **very high** acute mammalian toxicity; oral LD<sub>50</sub> rats = 120 mg/kg. **Symptoms of acute poisoning may occur shortly after use; long-term inhalation exposure to Sweep may cause lung damage**
15. PRECAUTIONS; FIRST AID: Wear standard protective clothing (see page 2) plus a pesticide respirator to avoid skin and lung exposure. Use standard first aid measures (see page 3) to clean skin and eyes. If swallowed, induce vomiting and see a doctor immediately.
16. STORAGE: Heated storage.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**TARGET (MCPA + mecoprop + dicamba)**  
Ciba Geigy

1. FORMULATIONS: Water soluble solution containing 275 g/L MCPA + 62.5 g/L mecoprop + 62.5 g/L dicamba; 10 L jugs.
2. REGISTERED MIXES: Target + Sencor 500 F  
Target + Lorox L or Afolan F
3. CROPS: Hard red spring and durum wheat (8.4), barley (8.5), oats (9.0). Thistle control on fallow.
4. WEEDS CONTROLLED: Buckwheat (tartary (7.0) and wild (6.1)), corn spurry (8.3), cow cockle (8.5), hemp-nettle (6.0), flixweed, knotweed, lamb's-quarters (8.7), mustards (8.8), pigweed (prostrate, redroot) (8.8), shepherd's-purse, smartweeds (annual) (6.3), sow-thistle (annual), stinkweed (8.4).
5. WEEDS SUPPRESSED: Canada thistle, bindweed (field and hedge).
6. WHEN USED: Wheat, oats - 2-5 leaf stage  
Barley - 2-3 leaf stage  
Summerfallow - thistles are in the early bud stage.  
Weed growth stage - 2-5 leaf stage  
*Note: Treatment at other than recommended crop stage may cause injury.*
7. HOW TO APPLY:  
**With:** Ground equipment.  
**Rate:** 405-610 mL/ac (1.0-1.5 L/ha), 610-810 mL/ac (1.5-2.0 L/ha) on summerfallow for thistle control.  
**Cost:** \$7/L  
**Water Volume:** 40 L/ac (100 L/ha)  
**Incorporation:** Not applicable  
**Pressure:** 275 kPa  
**Ground Speed:** 9 km/h  
**Nozzles:** All standard and low pressure nozzles delivering 40 L/ac (100 L/ha)
8. SPRAYING TIPS:
  - (a) For hemp-nettle control, apply before the second pair of leaves appear.
  - (b) Use the higher rate when weeds are beyond the 3 leaf stage, when weed densities are high or under adverse weather conditions.
9. HOW IT WORKS: Target is a combination of three systemic hormonal herbicides which accumulate in the growing point of susceptible plants, produce abnormal growth and disrupt the transport system in plants.
10. EXPECTED RESULTS:  
**Weeds:** Visible effects occur 7-14 days after treatment. Leaves curl, leaf edges turn brown, petioles twist, plant ceases growth and turns brown and dies.  
**Crop:** Improper or untimely application can result in abnormal bending at the nodes of grain stalks, difficulty in head emergence from sheath, curled awns, malformed kernels and sterile florets.  
*Poor results may be expected if:* there is poor coverage, rainfall less than three hours after application or weeds too advanced. Dicamba containing products can be hard on crops if incorrectly applied.
11. EFFECTS OF RAINFALL: Rainfall within 3 hours will reduce activity.
12. MOVEMENT IN SOIL: Not applicable.
13. GRAZING AND CROPPING RESTRICTIONS: None.  
**Drift:** Most vegetables and fruit crops are very sensitive.
14. TOXICITY: Low acute mammalian toxicity; oral LD<sub>50</sub> rats = 1,028 mg/kg. **Long-term continuous exposure to this product may produce enlarged kidneys** - non-toxic to fish; toxic to bees.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) to avoid exposure. Use standard first aid measures (see page 3) to clean skin and eyes. Induce vomiting if swallowed.
16. STORAGE: Heated storage only.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**TORCH, TORCH DS (bromoxynil)**  
Allied

**PARDNER (bromoxynil)**  
May & Baker

1. FORMULATIONS: Emulsifiable Concentrate

	<b>Torch DS</b>	<b>Torch</b>	<b>Pardner</b>
bromoxynil container size	450 g/L 10 L	225 g/L 20 L	225 g/L 20 L

2. REGISTERED MIXES:

<b>With:</b>	Avenge alone and with MCPA ester, 2,4-D amine, ester, Hoe-Grass 284, MCPA amine, ester, MCPA-K, Roundup, Atrazine	Avenge alone or with MCPA ester, 2,4-D amine or ester, Hoe-Grass, MCPA amine, ester, MCPA-K, Roundup	Atrazine, Avenge, 2,4-D Hoe-Grass, MCPA alone and with TCA, Roundup
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Mixing restrictions: Add amine 2,4-D, MCPA or MCPA-K to water first and then add bromoxynil.

3. CROPS:

Spring wheat (8.9), oats (8.5), barley (9.0), flax (8.6), canary grass (9.0), sweet corn (7.9), field corn (9.0), triticale (8.9). Seedling grasses grown for seed: brome grass (8.9), wheat grass (crested, intermediate, slender, tall) (8.5), meadow fescue (8.3), creeping red fescue (8.3), orchard grass (8.9), Russian wild rye (9.0), timothy (8.8), reed canary grass, fall rye (Torch DS only).

Durum wheat (8.9), winter wheat, zero till and all crops shown for Torch and Torch DS

Underseeding to legumes not recommended.

4. WEEDS CONTROLLED: Annual smartweeds (8.1), buckwheat (tartary, wild) (8.4), common groundsel (9.0), cow cockle (7.9), Kochia (8.2), knawel (7.7), lamb's-quarters (8.4), night-flowering catch fly (7.6), redroot pigweed (7.9), Russian thistle (8.4), scentless chamomile (8.7), stinkweed (8.4), wild mustard (8.5).

5. WEEDS SUPPRESSED: None

6. WHEN USED: See crops on which each is registered.

Weeds: Seedling to 4 leaf stage except Russian thistle to 5 cm tall. Generally best results if weeds are in seedling stage.

Crops: Wheat, barley, oats, triticale - 2 leaf to early flag leaf. Use tank mix with 2,4-D on wheat or barley after 4 leaf. Winter wheat, fall rye - first growth to early flag leaf. Winter wheat - fall - 2 - 4 leaf. Corn - used alone or with atrazine - until crop is 25 cm tall, then use alone with drop pipes. Flax when 5-10 cm tall. Canary seed grass - 3-5 leaf. Seedling grasses, grown for seed - 2-4 leaf.

7. HOW TO APPLY: Ground equipment - spray coupes - not recommended.

<b>Rate:</b>	<b>Torch DS</b>	<b>Torch</b>	<b>Pardner</b>
Wheat, barley, oats, corn (field, sweet), canary seed, triticale	250-300 mL/ac (620-750 mL/ha)	500-600 mL/ac (1.2-1.5 L/ha)	
Flax	250 mL/ac (620 mL/ha)	500 mL/ac (1.2 L/ha)	
Winter wheat, fall rye	300 mL/ac (750 mL/ha)	500-600 mL/ac (1.2-1.5 L/ha)	
seedling grasses (grown for seed)	350 mL/ac (875 mL/ha)	500 mL/ac (1.2 L/ha)	

**Cost:** \$18/L \$9/L

**Water volume:** 40 L/ac (100 L/ha) except corn - 60 L/ac (150 L/ha).

**Incorporation:** Not applicable.

**Pressure:** 275 kPa

**Ground Speed:** 9 km/h

**Nozzles:** Flooding type nozzles not recommended.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

8. SPRAYING TIPS: When preparing Pardner/Atrazine mix, add Pardner last. Do not use oil or surfactant. To control scentless chamomile and knawel, spray before 3 leaf stage.
9. HOW IT WORKS: Bromoxynil is a contact herbicide so good coverage is essential. Inhibits respiration and photosynthesis causing death.
10. EXPECTED RESULTS: Weeds turn brown and die within 3-5 days - more rapid under good growing conditions and when applied to seedling weeds. Poor results can be expected if: weeds past 4 leaf stage, poor spray coverage or, lower than recommended rate used. Injury to corn or flax may occur if under stress.
11. EFFECTS OF RAINFALL: None.
12. MOVEMENT IN SOIL: None.
13. GRAZING AND CROPPING RESTRICTIONS: None.
14. TOXICITY: Has a high acute mammalian toxicity, oral LD<sub>50</sub> rats = 245 mg/kg. Symptoms of acute poisoning such as stomach cramps, diarrhea, sore throat may appear. Very toxic to fish, snails and slugs.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) when applying. Use standard first aid measures (see page 3) if skin and eyes are heavily exposed. Do not induce vomiting if swallowed. See a doctor.
16. STORAGE: Torch DS does not require heated storage. Pardner and Torch will crystallize if frozen. To suspend - warm gradually and agitate until crystals dissolve.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**TORDON (Industrial) (picloram)**  
Dow

Available only to approved personnel.

1. FORMULATIONS: Tordon 10K pellets - 10% picloram - 25 kg. Tordon 22K herbicide - 240 g/L as potassium salt - 18.9 L. Tordon 101 Mixture -picloram - 60 g/L + 2,4-D - 240 g/L.
2. REGISTERED MIXES: None.
3. CROPS: Tordon 10K pellets are registered for brush control. Tordon 101 Mixture for brush control and weeds on rights-of-way. Tordon 22K for controlling deep rooted perennial and biennial weeds on rangeland, permanent grass pastures, non-cropland and for spot treatment on crop land, when applied by an authorized pesticide applicator.
4. WEEDS: Tordon will control most broad-leaved weeds and brush.
5. WEEDS SUPPRESSED: None.
6. WHEN USED: Tordon 101 Mixture and Tordon 22K - applied after leaves are fully expanded until about 3 weeks before frost. Tordon 10K pellets -applied in spring, just before or during periods of vigorous growth.
7. HOW TO APPLY:

	<b>Tordon 10K Pellets</b>	<b>Tordon 22 K</b>	<b>Tordon 101 Mixture</b>
<b>With:</b>	Cyclone spreader, ground operated granular spreader, aerial spreader.	ground or hand sprayer drift control agent.	Ground equipment or helicopter using
<b>Rate:</b>	16-30 kg/ac (40-95 kg/ha) - depending upon species.	450 mL-3.6 L/ac (1.1-9.0 L/ha) depending upon weed species.	Brush - 10 L in 1000 L water Weeds - 2.8 L/ac (7 L/ha)

**Water Volume:** Use 80-800 L/ac (200-2000 L/ha) of water, depending upon density of growth.

**Incorporation:** Not applicable.

**Pressure:** 300 kPa for applications in range of 80 L/ac; (200 L/ha) and for applications up to 800 L/ac; (2000 L/ha), reduce pressure.

8. Spraying Tips: Spread Tordon 10K Pellets evenly over the ground surface above tree roots. Higher rates may cause grass injury in drier areas of the province.  
Tordon 22K used as a spot treatment in a crop should not exceed 1 acre (.4 ha) and the total area treated in any one field in a year should not exceed 5% of the total acreage.
9. HOW IT WORKS: Interferes with cell division, causing leaf cupping, stem distortion and eventual death of the plant. Tordon 10K pellets require moisture to carry the picloram to the roots. Tordon 101 and 22K are absorbed through leaves and roots.

**10. EXPECTED RESULTS:**

*Tordon 10K Pellets:* 2 to 3 weeks after the first rainfall after treatment, leaves of affected trees become dull and cupped; orange streaks appear on the stems of poplar trees, leaves become brown and brittle, as the tree dies.

*Tordon 101 Mixture:* 2 to 3 weeks after treatment symptoms as above occur.

*Tordon 22K Herbicide:* Perennial weeds show distorted stems and cupped leaves, which turn yellow and then brown. Usually native grass increases in abundance as a result of reduced competition.

Poor results may be expected if there is heavy rainfall immediately after treatment on light sandy soil.

11. EFFECTS OF RAINFALL: Heavy rainfall may dissolve and carry picloram away from the target area, or percolate the dissolved picloram out of the root zone of the target plants.
12. MOVEMENT IN SOIL: Picloram is very soluble in water and moves readily with water.
13. GRAZING AND CROPPING RESTRICTIONS: Manure from picloram treated vegetation should not be used to grow sensitive crops but rather be returned to a cereal crop field.  
When applied as a spot treatment on cropland, picloram may persist in soil for up to 5 years, and prevent the establishment of sensitive crops. Where wheat, oats, barley and rapeseed are the major crops in the rotation program, the following sequence is suggested to start the year after treatment: **First Year:** Oats or rapeseed; **Second Year:** Oats, rapeseed or barley; **Third Year:** Oats, rapeseed, barley or wheat. A reduction in yield in the first year, is usually offset by the benefits of weed control obtained. Tordon IndustrialLegumes may not be established in a pasture for several years after a Tordon herbicide treatment. If legumes are essential in a pasture, do not use Tordon herbicide.
14. TOXICITY: Very low acute mammalian toxicity - oral LD<sub>50</sub> - rats =  
Technical Picloram - 8200 mg/kg  
Tordon 10K Pellets - 10,300 mg/kg  
Tordon 101 Mixture - 8,000 mg/kg
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). Use standard first aid measures (see page 3) if skin and eyes are contaminated.
16. STORAGE: Tordon 10K Pellets: Store in a cool, dry place. Tordon 22K Herbicide and Tordon 101 Mixture: Store in a cool, dry place. Do not freeze. If freezing occurs, warm and mix thoroughly.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**TORDON 202C (picloram + 2,4-D)**  
Dow

1. FORMULATIONS: Picloram 12 g/L + 2,4-D 200 g/L, 20 L
2. REGISTERED MIXES: None
3. CROPS: Wheat (7.7) and barley (8.7)  
*Underseeding:* Not recommended.
4. WEEDS CONTROLLED: Buckwheat (tartary (4.7) and wild (7.2)), cocklebur, green smartweed (5.9), lamb's-quarters (7.4), redroot pigweed (7.1), Russian thistle (7.8), wild mustard (8.6), spring seedlings of stinkweed (8.0) and dandelion.
5. WEEDS SUPPRESSED: Scentless chamomile, Canada thistle.
6. WHEN USED: 3-5 leaf stage of crop. Seedling (2-4 leaf) stage of weeds.
7. HOW TO APPLY:  
**With:** Ground equipment  
**Rate:** 600-800 mL/ac (1.5-2.0 L/ha)  
**Cost:** \$4.00/L  
**Water Volume:** 40 L/ac (100 L/ha)  
**Incorporation:** Not applicable  
**Pressure:** 275 kPa  
**Ground Speed:** 9 km/h  
**Nozzles:** All standard, low pressure nozzles delivering 40 L/ac (100 L/ha)
8. SPRAYING TIPS: Treat during warm weather when the weeds are young and growing actively. Use the maximum rates under dry or cool conditions.
9. HOW IT WORKS: Absorbed by leaf, stem and roots and translocated throughout the plant to the growing points. Some soil residue controls late germinating weeds.
10. EXPECTED RESULTS: Death of weeds is not immediate but growth is slowed and eventually ceases.
11. EFFECTS OF RAINFALL: Rainfall within 4 to 6 hours of application may reduce activity.
12. MOVEMENT IN SOIL: Picloram degrades very slowly in soil and water, and may be leached out, after rainfall, from soils low in organic matter.
13. GRAZING AND CROPPING RESTRICTIONS:  
*Drift:* Small amounts can damage many desirable broad-leaf plants.  
*Use of Straw from Treated Fields:* Do not use straw from treated crops for compost or mulching on susceptible broad-leaf crops. If straw is used for bedding or animal feed return the manure to fields to be planted to grain crops, flax or rapeseed.  
*Succeeding crops:* Do not plant susceptible broad-leaf crops such as sunflowers, beans, peas or potatoes the year following treatment. Fallow or replant to grain crops.  
*Handling Treated Soils:* Treated soil should not be moved to other areas, nor used to grow susceptible broad-leaf plants unless an adequately sensitive bioassay or chemical test shows that no detectable picloram is present.
14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats = 2,460 mg/kg. Non-toxic to fish and bees; may cause eye irritation. There is no dioxin in the 2,4-D of this formulation.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) to avoid exposure. Use standard first aid measures (see page 3) to clean skin and eyes. If swallowed, induce vomiting.
16. STORAGE: Heated storage. If freezing occurs, warm and mix thoroughly before using.

## PRACTICAL USE CONSIDERATIONS

1. Sensitive crops may be affected by Tordon 202C residue for many years after application.
2. Application of Tordon 202C under dry conditions may result in straw shortening in wheat. There may be more tillers per plant, but severe crop injury may appear.
3. For complete, updated information concerning seeding speciality crops and to determine the sensitivity of crops not listed above, call 1-800-661-6436.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**(Cereals)**

1. FORMULATIONS: Treflan: Emulsifiable concentrate 545 g/L, 8.5 L container.  
Rival: Emulsifiable concentrate 500 g/L; 9 L container.
2. REGISTERED MIXES: With Avadex BW, Liquid Fertilizer, and Avadex BW + Liquid Fertilizer.  
Mix Restrictions: Add trifluralin or trifluralin + Avadex directly into the liquid fertilizer, mix thoroughly and apply as soon as possible. Agitate until application is complete.
3. CROPS: Wheat (spring and durum), barley. Underseeding: Not recommended.
4. WEEDS CONTROLLED: Green foxtail.
5. WEEDS SUPPRESSED: None
6. WHEN USED: Apply alone or as a tank mix with Avadex BW in the spring after seeding and prior to emergence of wheat or barley.
7. HOW TO APPLY:

**With:** Ground Equipment

**Rate:** Treflan: 445 mL/ac (1.1 L/ha), Rival: 485 mL/ac (1.2 L/ha) on light to medium textured soil. Treflan: 610 mL/ac (1.5 L/ha), Rival: 650 mL/ac (1.6 L/ha) on heavy textured soil.

**Cost:** \$13/L

**Water Volume:** 40 L/ac (100 L/ha)

**Incorporation:** Incorporate 2-4 cm with two cross harrowings with tine or diamond harrows operated at a speed of at least 9 km/h. Both incorporations should be done within 24 hours of application.

**Pressure:** 275 kPa

**Nozzles:** Standard and low pressure nozzles delivering 40 L/ac (100 L/ha).

8. SPRAYING TIPS: Apply only on fields that are trash free or summerfallow fields. Crop must be seeded 5-8 cm deep in a well tilled seedbed to prevent contact between the chemical and the seed.
9. HOW IT WORKS: Acts on both the root and shoot tips as they emerge. Prevents cell division and affected plants die before emergence. If the shoot portion of the plant escapes to the soil surface, lateral or secondary root growth is inhibited causing a slow death since the plant is unable to gather moisture or nutrients.
10. EXPECTED RESULTS: Green Foxtail: Seeds that germinate below the treated layer will produce plants that will emerge. The secondary root system of plants that form within the treated layer is completely inhibited by trifluralin present in that area. The affected plant dies slowly as crop competition and temperature stress over-tax the rootless plant's ability to take up moisture. Crop injury is minimized when seeded to a depth of 5-8 cm.
11. EFFECTS OF RAINFALL: No effect once incorporated into the soil.
12. MOVEMENT IN SOIL: None.
13. GRAZING AND CROPPING RESTRICTIONS: None.
14. TOXICITY: Very low acute mammalian toxicity - oral LD<sub>50</sub> rats = 10,000 mg/kg. In clean water, fish are very sensitive to trifluralin; but in runoff and muddy water, trifluralin binds to the suspended soil particles and large amounts can be tolerated by fish. Non-toxic to bees.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). Use standard first aid methods (see page 3) to clean skin and eyes. If swallowed - do not induce vomiting - get medical attention.
16. STORAGE: Do not store below 5°C. If stored below 5°C, bring the contents to 15°C for 24 hours and shake well before using.

**Special Use: Treflan QR5 on Barley ONLY.**

Weeds Controlled/Spraying Tips: See QR5 under oilseed.

When Used: Fall application **only**. September 1 to freeze up.

How to Apply: See QR5 under oilseed.

**Rate:** On light brown and dark brown soil (2-4% O.M.): 6.9 kg/ac (17 kg/ha).  
On medium or heavy brown and dark brown soils (2-4% O.M.): 8.9 kg/ac (22 kg/ha).  
On light black soils (4-6% O.M.): 8.9 kg/ac (22 kg/ha).  
On medium or heavy black soils (4-6% O.M.): 11.3 kg/ac (28 kg/ha).

**Warning:** Do not apply on soils containing less than 2% organic matter or on deep black soil containing more than 6% organic matter. Application to severely eroded knolls may result in reduced crop stand. Do not apply on land treated with Treflan since June 1 of the previous year. Using press or hoe drill, seed 5 cm deep into a moist, warm seedbed. Avoid seeding into very cold soil.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**(Oilseeds, Special Crops, Vegetable Crops)**

1. FORMULATIONS: Treflan: Emulsifiable concentrate 545 g/L (Treflan 545EC), 8.5 L container. 5% Granular (Treflan QR5), 25 kg bags.  
Rival: Emulsifiable concentrate 500 g/L, 9 L container.
2. REGISTERED MIXES: Trifluralin + Liquid Nitrogen Fertilizer (28-0-0). (Pour directly into liquid fertilizer, mix thoroughly and apply as soon as possible with constant agitation.)

Treflan 545 EC + Sencor 500 F or 75 DF - Fababeans, Triazine tolerant canola (see Spectrum).

3. CROPS: Rapeseed (8.8), mustard (9.0), sunflowers (9.0), peas (8.7), soybeans (8.9), dry beans (8.0), lentils\* (8.7), fababeans (8.6), flax\* (7.7), crambe, snapbeans (8.8), lima beans, carrots (8.4), turnips, and transplants of tomatoes (9.0), peppers, broccoli (9.0), brussel sprouts (9.0), cabbage and cauliflower (8.0); direct seeded cabbage and cauliflower, and triazine tolerant canola.

\* Fall application only. Rival can be used on that in the summer as well.

Underseeding: Not recommended.

4. WEEDS CONTROLLED: Annual bluegrass, barnyard grass (8.3), bromegrass, buckwheat (wild) (8.3), chickweed (7.1), cow cockle (9.0), downy brome, foxtail (green and yellow) (8.1), knotweed, lamb's-quarters (8.0), Persian darnel, pigweed (8.2), purslane, Russian thistle (7.9), wild oats (7.5).

5. WEEDS SUPPRESSED: None.

6. WHEN USED:
  - Spring application: cultivate to destroy existing weeds and apply pre-plant.
  - Fall application: September 1st to freeze-up.
  - **Fall incorporation is discouraged where soil drifting is a problem.**
  - Summer application: On summerfallow between June 1st to September 1st.

*Special Instructions for Flax and Lentils:* Not recommended for spring application. Both incorporations of Trifluralin or QR5 must be done in the fall. Shallowly till and pack the soil in the spring to ensure a firm seedbed and an accurate depth for seeding.

**NOTE** - Rival can also be used in the summer.

7. HOW TO APPLY:

**With:** Ground equipment

**Rate:** Spring Application

- (a) Treflan: 610 mL/ac (1.5 L/ha); Rival: 650 mL/ac (1.6 L/ha) on sandy soils less than 6% organic matter.
- (b) Treflan: 810 mL/ac (2.0 L/ha); Rival: 890 mL/ac (2.2 L/ha) - on medium or heavy textured soils, 6-15% organic matter, and low to medium wild oat infestations. For heavy wild oat infestations apply Treflan: 1050 mL/ac (2.6 L/ha); Rival: 1.1 L/ac (2.8 L/ha).

*Fall Application*

- (a) Treflan: 810 mL/ac (2.0 L/ha); Rival: 890 mL/ac (2.2 L/ha) - on sandy soils less than 6% organic matter.
- (b) Treflan: 1050 mL/ac (2.6 L/ha); Rival: 1.1 L/ac (2.8 L/ha) - on medium or heavy textured soils, 6-15% organic matter, and low to medium wild oat infestations. For heavy wild oat infestation apply Treflan: 1.2 L/ac (3.0 L/ha); Rival: 1.4 L/ac (3.4 L/ha).

*Summer Application - Between June 1st and September 1st Treflan - 1.2 L/ac (3 L/ha); Rival: 1.4 L/ac (3.4 L/ha) or Treflan QR5 - 13.5 kg/ac (33 kg/ha) on all soils.*

*Triazine Tolerant Canola*

See Spectrum or Sencor for application rates as a tank mix with Sencor. Treflan 545 EC and QR5 alone may be applied in the summer, fall and spring for Triazine Tolerant Canola. Sencor, may then be applied after crop emergence to control several additional weeds.

**Cost:** Treflan 545 EC - \$13/L. Treflan QR5 - \$1.25/kg.

**Water Volume:** 40 L/ac (100 L/ha).

**Incorporation:** Two incorporations at right angles must be done within 24 hours of application. A tandem disc, diser or field (vibra shank) cultivator are recommended for incorporating to 8-10 cm. To get the best mixing action, operate the disc implement at 6-10 km/h and the cultivator at 10-13 km/h.

**Pressure:** 275 kPa

**Nozzles:** Nozzles that will apply 40 L/ac (100 L/ha).

8. SPRAYING TIPS: Use on soils with less than 20-25% straw cover. On stubble, chop and thoroughly mix residues and weed growth into the soil before application. Treflan QR5 can be used when trash is heavy or weeds standing, providing this causes no interference with granule distribution and incorporation.

A tandem disc mixes best on stubble or poor condition soils (crusted, lumpy or wet). Fall application should be followed with 2 incorporations at right angles, before freeze-up. This or a summer application should be preceded by a light spring tillage to a 5-8 cm depth before seeding.

Do not apply on soils that are wet in poor tilth, or contain 15% + organic matter. To avoid concentrating wild oat seeds below the treated layer, do not plow land prior to trifluralin application.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

9. HOW IT WORKS: Trifluralin kills seedlings as they germinate. Inhibits cell division in the actively growing points of the root and shoot.
10. EXPECTED RESULTS: Most weeds die before emerging. Weeds will exhibit swelling in the coleoptile region, stubby, thick primary root development and lack of secondary roots, which leads to death due to inadequate moisture obtaining ability.  
*Crop:* Seed flax into a well packed warm moist seedbed. Do not seed deeper than 4 cm.
11. EFFECTS OF RAINFALL: No effect once trifluralin is incorporated into the soil.
12. MOVEMENT IN SOIL: None.
13. GRAZING AND CROPPING RESTRICTIONS: None.  
*Crop Use After Hail:* No restrictions  
*Succeeding Crops:* Normally, trifluralin carry over will not harm crops grown in rotation. As a precaution, oats, sugar beets and small seeded annual grasses should not be grown in rotation following a trifluralin treated crop.  
Drought conditions in the year of treatment may result in higher levels of trifluralin carry-over into the next year. To avoid wheat injury, seed less than 7 cm deep into a warm moist seedbed.
14. TOXICITY: Very low acute mammalian toxicity - oral LD<sub>50</sub> rats = 10,000 mg/kg. In clean water, fish are very sensitive to trifluralin, but in run off or muddy water, it binds to soil particles and large amounts can be tolerated by fish. Non toxic to bees.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). Use standard first aid methods (see page 3) to clean skin and eyes. If swallowed - do not induce vomiting - get medical attention.
16. STORAGE: Do not store Rival or Treflan 545EC below 5°C. If stored below 5°C, bring the contents to 15°C for 24 hours and shake well before using. Do not store near heat, spark or open flame.

## CONSIDERATIONS

1. Alfalfa and most clovers are tolerant to trifluralin.
2. Unsatisfactory control will result when QR-5 granules are spring applied.
3. The use of an air seeder produces a non-uniform depth of seeding and can result in patchy germination.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**TROPOTOX (MCPB)**  
May and Baker

1. FORMULATIONS: Liquid - 400 g/L - 4 and 20 L packs.
2. REGISTERED MIXES: None
3. CROPS: Field peas (8.4)
4. WEEDS CONTROLLED: Annual sow-thistle, annual smartweeds, curled dock, flixweed, hemp-nettle, lamb's quarters (8.5), mustards (ball, wild, wormseed) (7.5), plantain, ragweed, redroot pigweed (7.9), purslane, stinkweed (6.7), tall buttercup.
5. WEEDS SUPPRESSED: Canada thistle (5.4), field bindweed (3.2), shepherd's purse (4.0).
6. WHEN USED: Peas - 3-6 expanded leaves.
7. HOW TO APPLY:  
**With:** Ground equipment.  
**Rate:** 1.4-1.7 L/ac (3.5-4.25 L/ha)  
**Cost:** \$7/L  
**Water Volume:** 60-80 L/ac (150-200 L/ha).  
**Pressure:** 275 kPa  
**Ground Speed:** 9 km/h  
**Nozzles:** All standard nozzles delivering 60-80 L/ac (150-200 L/ha).
8. SPRAYING TIPS: Apply in warm weather when weeds are actively growing. Provides only top growth control of Canada thistle and field bindweed.
9. HOW IT WORKS: Systemic, absorbed by leaves and stem. Selectivity is based on ability of some plants to convert MCPB to MCPA.
10. EXPECTED RESULTS: Weeds begin to twist within 2-10 days, turn brown and die within 2-3 weeks.  
Poor results may be expected if water volume is incorrect or weeds too mature. If peas are beyond proper stage or are under drought or disease stress, damage may occur.
11. EFFECT OF RAINFALL: Rainfall before spray has dried on leaves will decrease activity.
12. MOVEMENT IN SOIL: Not applicable.
13. GRAZING AND CROPPING RESTRICTIONS: None listed.
14. TOXICITY: Slightly high acute oral toxicity to mammals - oral LD<sub>50</sub> - rats - 500 mg/kg. Non-toxic to bees.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). Use standard first aid measures (see page 3) in case of skin or eye contamination. Induce vomiting if swallowed and see a doctor.
16. STORAGE: Heated storage required.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**TROPOTOX PLUS (MCPB + MCPA)**  
May and Baker

1. FORMULATIONS: Water soluble solution 375 g/L MCPB + 25 g/L MCPA  
Available in 20 L containers
2. REGISTERED MIXES: None
3. CROPS: Spring wheat (8.9), barley (8.8), oats, fall rye, seedling clover (wild white, white Dutch, Ladino, alsike (7.2) and red), field peas (8.1), pasture, field corn. Underseeding: For clover, can be used on a cereal companion crop.
4. WEEDS CONTROLLED: Bull thistle, Canada thistle (6.1), curled dock, field bindweed (3.2), hemp-nettle (5.9), knotweed, lamb's-quarters (8.2), mustards (ball, wormseed and wild) (7.9), purslane, ragweed, redroot pigweed (8.3), shepherd's-purse (5.0), smartweeds (annual) (5.1), sow-thistle (annual) (5.4), stinkweed (7.5), tall buttercup.
5. WEEDS SUPPRESSED: Not applicable.
6. WHEN USED:
  - Cereals - 2 leaf to flag leaf stage
  - Clover - first true leaf stage to 4th true leaf stage
  - Peas - 3-6 expanded leaves
  - Pasture - after grazing or cutting
  - Corn - 45 cm high but before tasseling begins, with drop nozzles
  - Weeds - seedling stage
7. HOW TO APPLY:
  - With:** Ground equipment
  - Rate:** 1.1-1.7 L/ac (2.7-4.2 L/ha) depending on weeds to be controlled.
  - Cost:** \$6.50/L
  - Water Volume:** 60-80 L/ac (150-200 L/ha)
  - Pressure:** 275 kPa
  - Ground Speed:** 9 km/h
  - Nozzles:** All standard nozzles delivering 60-80 L/ac (150-200 L/ha)
8. SPRAYING TIPS: Spray in warm weather when plants are actively growing.
9. HOW IT WORKS: A systemic herbicide absorbed by leaves and stems, translocated to actively growing regions, disrupts cell division, ceases cell growth and interferes with respiration and food reserves. Selectivity based on ability of plant to efficiently convert MCPB to MCPA.
10. EXPECTED RESULTS:

*Broad-leaved weeds:* Should be dead within 2-3 weeks of treatment.  
Poor results may be expected if water volume is incorrect or weeds are too mature.
11. EFFECTS OF RAINFALL: Rainfall before the foliage has dried from the spraying may decrease activity.
12. MOVEMENT IN SOIL: Not applicable.
13. GRAZING AND CROPPING RESTRICTIONS: None listed.
14. TOXICITY: Has a slightly high acute toxicity to mammals; oral LD<sub>50</sub> rats = 500 mg/kg. Non-toxic to bees.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) to avoid exposure. Use standard first aid measures to clean skin and eyes (see page 3). Induce vomiting if swallowed.
16. STORAGE: Store in heated area.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**VELPAR (hexazinone)**  
DuPont

1. FORMULATIONS: Soluble powder - 90% hexazinone - 25 kg pack.
2. REGISTERED MIXES: None.
3. CROPS: Non-crop land only. An industrial herbicide for total vegetation control.
4. WEEDS CONTROLLED: Annual and perennial grasses, broad-leaved weeds and some woody species.
5. WEEDS SUPPRESSED: None.
6. WHEN USED: Apply just before or when weeds are actively growing.  
Do not apply to frozen ground.
7. HOW TO APPLY:

**With:** Fixed boom sprayer, handgun, back pack sprayers, or a watering can for smaller areas.

**Rate:** For contact top growth or short term (3 month) control - apply 1.1-1.8 kg/ac (2.7-4.5 kg/ha) as a foliar spray. For more than one season control, apply 1.8-3.6 kg/ac (4.5-9.0 kg/ha) as a foliar spray. The higher rates of application should be used on fine textured soil (clay or clay loam) or on soils containing more than 5% organic matter.

**Cost:** \$64/kg

**Water Volume:** When applying with a handgun use a minimum of 650 L/ac (1,600 L/ha) of spray solution.

8. SPRAYING TIPS: See "Soil Sterilant" page 4.
9. HOW IT WORKS: A systemic herbicide readily absorbed through the roots and foliage and translocated upwards. Inhibits photosynthesis.
10. EXPECTED RESULTS: Plants become chlorotic soon after treatment and then die. Rainfall will increase efficacy. Poor results may be expected if there is inadequate application rate, weed growth too mature, insufficient rainfall or application on areas subject to severe soil erosion.
11. EFFECTS OF RAINFALL: Rainfall less than 4 hours after application may affect the contact activity.
12. MOVEMENT IN SOIL: Velpar moves downward in the soil to the root zone of woody species.
13. GRAZING AND CROPPING RESTRICTIONS: None.

*Succeeding Crops:* Velpar is a non-selective residual herbicide. Only used on non-crop land.

14. TOXICITY: Very low acute mammalian toxicity - oral LD<sub>50</sub> - rats = 1690 mg/kg. May cause some eye irritation. Slightly toxic to fish.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2), use standard first aid measures (see page 3) to clean skin and eyes.
16. STORAGE: Store in a cool, dry place.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*



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## CHEMICAL INSECT CONTROL IN ALBERTA

### **Introduction**

The degree of infestation and the severity of insect damage varies drastically from area to area and season to season. Some pests, such as grasshoppers and bertha armyworm, require control during periods of abundance which may last from one to several years. Other pests are perennial; sugar beet root maggot, for example, is controlled by the application of a granular insecticide at planting.

To insure proper use of insecticides identify the pest, learn its biology, check your fields and don't panic when you see an insect in your crop. Keep in touch with extension personnel to obtain information on pending pest problems and keep in mind the previous years' problems so you are prepared for changes in insect population levels.

### **Chemical Control**

Attention to the following points should lead to more effective control. Insecticides will kill the pest insect if applied properly at a stage when the pest is susceptible. An application that is made too early or too late in the life cycle may not provide adequate control and would be wasteful. Follow label instructions for proper application and learn the biology of the pest. Base control decisions on the amount of foliage, weather conditions, age and size of the insect and dosage required. Most insecticides have limited residual control properties when applied to foliage; if insects are moving into crops or emerging over an extended period, several applications in the same season may be necessary.

### **Safety**

In general, insecticides are more toxic to humans, wildlife, fish, bees and other non-target organisms than herbicides. Follow label directions for safety precautions associated with application of each insecticide. Refer to pages 4-13 for general information on pesticide toxicity, exposure, safety precautions, protective equipment, symptoms, first aid, poison control centres, and disposal. Specific information on safety is included with each insecticide.

### **Bee Safety**

Honey bees and other pollinators are susceptible to most insecticides. If applications are made to weeds or crops in bloom, severe pollinator mortality may occur. To reduce this risk, apply insecticides in late evening (most preferred) or early morning when bees are not flying. Advise beekeepers in the area to be sprayed at least 48 hours before application so they can protect their bees. Never allow insecticide spray to drift directly onto an apiary site. Do not apply insecticides to water bodies which may be used by bees.

### **Livestock and Residues**

The number of days between application of an insecticide and harvesting, feeding to livestock, or grazing is given on the label. These restrictions must be followed to prevent illegal residues and eliminate hazards to the consumer. Follow the label instructions.

### **The Manual**

This manual includes only the major insecticides registered for use in Alberta. Not all insects controlled are listed for each pesticide; see the labels for complete listings.

**\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\***

**AMBUSH, POUNCE (permethrin)**  
**Chipman/Chemagro**

1. FORMULATIONS: Emulsifiable concentrates - Ambush (500 g permethrin/L)  
 Pounce (384 g permethrin/L).
2. HOW IT WORKS: Works by contact on a wide range of pests. Good residual activity. No systemic or fumigant activity.
3. APPLICATION:

**With:** Ground equipment only.

<b>Rate:</b>	<b>Crop</b>	<b>Insect</b>	<b>Formulation</b>	<b>mL/ac</b>	<b>(mL/ha)</b>
	Barley, corn, oats, rye, wheat, canola, mustard, sunflower, sugar beets, sweet corn(1) Sweet Corn(1)	Cutworms (army, pale western, red-backed)	Ambush 90-120+	55 (225-300)+	(140)
	Potato(1)	Corn earworm, European corn borer	Ambush or Pounce	80-110 110-150	(200-275) (275-375)
		Colorado potato beetle, potato flea beetle, potato leafhopper	Ambush	55-80	(140-200)

Notes: 1. Pre-harvest interval (days) given in brackets after crop.

**Cost:** \$140/L. Container sizes - 1 L, 500 mL.

**Water Volume:** Corn applications; use: with Ambush 130-180 L/ac (325-450 L/ha), with Pounce 140-180 L/ac (350-450 L/ha)  
 Potato application, use sufficient water to obtain thorough coverage of foliage.

4. SPRAYING TIPS: Use the high rate for heavy infestations (anticipated or actual), or when adult insects are present, or when foliage is dense, or (for cutworms) when soil is dry+.

Corn - spray not later than when first feeding damage is seen on foliage. For control of corn earworm, direct spray to ensure coverage of ears and silk.  
 For European corn borer control, consult with provincial agriculturalist for proper timing of spray.

5. GRAZING RESTRICTIONS: Do not feed any crop treated with permethrin to livestock.
6. TOXICITY: Acute oral LD<sub>50</sub> = 430 - 4000 mg/kg (rat)
7. PRECAUTIONS, FIRST AID: Severe eye irritant. Wear protective equipment to avoid contact with skin and eyes - DO NOT inhale spray mist. Toxic to bees, do not spray when bees are foraging. Keep product away from fire, open flame, electric light bulbs and other sources of heat. In case of contact -skin - wash thoroughly with soap and water - eyes - flush with water for 15 minutes. If swallowed - DO NOT induce vomiting or administer liquids; product contains petroleum distillates. Get medical attention immediately.
8. DECONTAMINATION AND DISPOSAL: Rinse empty bottle 3 times with clean water, each time disposing of rinse in the spray tank. Break rinsed bottle and cap and dispose of in garbage.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**COUNTER (terbufos)**  
**Cyanimid**

1. FORMULATIONS: Granules - Counter 5-G (5% terbufos), Counter 15-G (15% terbufos)
2. REGISTERED MIXES: 5G may be mixed with fungicide treated seed.
3. HOW IT WORKS: Terbufos is a systemic, organophosphorus insecticide with effective initial and residual activity.
4. APPLICATION:

**With:** Ground equipment.

<b>Rate:</b>	<b>Crop</b>	<b>Insect</b>	<b>Formulation</b>	<b>kg/ac</b>	<b>(kg/ha)</b>
	Canola, mustard	Flea beetle	5-G	2.2-4.5	(5.5-11.0)
	Sugar beet	Sugar beet root maggot, wireworm	45 g 15-G/100 m row (minimum row spacing of 50 cm)		

**Cost:** 5-G - \$2.35/kg. Container size - 20 kg. 15-G - \$3.75/kg - Container size - 25 kg bag.

**Incorporation:** Canola and mustard - carefully blend seed and granules together using a mechanical mixer or stirring with a stick in the drill box  
Sugar beets - apply in furrow, 5-8 cm behind the seed drop zone after some soil has covered the seed.

5. APPLICATION TIPS: Note: If extreme infestations are anticipated use the high rate. Do not apply later than at planting time. Do not place 15-G granules in direct contact with seed. When a seed treatment is also used - mix the seed treatment with seed, then mix granules with treated seed.
6. GRAZING RESTRICTIONS: Sugar beet tops and beet pulp may be fed to livestock after harvest.
7. TOXICITY: Acute oral LD<sub>50</sub> = 1.6 mg/kg (rat)
8. SAFETY: Symptoms of poisoning may include: weakness, headache, tightness of chest, blurred vision, non-reactive pinpoint pupils, salivation, sweating, nausea, vomiting, diarrhea and abdominal cramps.

First aid: IN CASE OF EMERGENCY endangering life or property involving these products, call collect, day or night, 1-416-356-8310.

ATROPINE IS AN ANTIDOTE. Consult your physician about obtaining a supply of 0.65 milligram tablets for emergency use. If symptoms include blurred vision, stomach cramps or tightness in chest, don't wait for a physician but take two tablets at once. Do not take atropine unless symptoms of poisoning have occurred. Anyone who has been sick enough to have taken atropine must be seen by a physician as soon as possible.

CALL A PHYSICIAN AT ONCE IN ALL CASES OF SUSPECTED POISONING IF SWALLOWED - drink one or two glasses of water and induce vomiting by touching back of throat with finger. Do not induce vomiting or give anything by mouth to an unconscious person. Get medical attention.

IF INHALED - remove to fresh air. If not breathing give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen.

IF IN EYES - immediately flush eyes or skin with plenty of water for at least 15 minutes. Get medical attention.

IF ON SKIN - immediately remove contaminated clothing and wash skin thoroughly with soap and water. Launder clothing before re-use. Wash thoroughly with soap and water before eating, drinking or smoking. Bathe at the end of the work day, and change outer clothing.

9. PRECAUTIONS: Rapidly absorbed through skin. Repeated inhalation or skin contact may, without symptoms, progressively increase susceptibility to poisoning. While transferring from package to equipment, wear a clean cap and gloves (rubber or cotton). If cotton gloves are used, they must be laundered or discarded after each day's use. Rubber gloves should be washed with soap and water after each use. Do not wear the same gloves for other work.

DO NOT BREATHE DUST - While emptying bags into equipment, pour downwind and allow as little free fall as possible. Do not pour at face level and do not allow dust to reach the breathing zone. Sweep up and bury spillage whether it occurs indoors or in the field. Once a bag has been opened, use it completely or bury the remainder. Make sure that the hoppers of equipment are emptied while still in the field. Cover granules that may be exposed on the ends of the treated rows, turns and field loading areas. Keep all unprotected persons out of the operating areas.

10. DECONTAMINATION: Decontamination Solution - Into 10 L of water slowly and carefully add in sequence 130 g detergent followed by 525 g caustic soda (lye) and finally 1.2 litres of commercial bleach (sodium hypochlorite). Handle and use the solution with great care. Do not add water to dry lye. If spill occurs on floor areas use a sweeping compound to clean up. Decontaminate the waste with decontamination solution. Wash floor with decontamination solution and rinse well with clean water. Clean up solution and rinse water with absorbent materials such as sawdust, sweeping compound, rags, etc. Dispose of waste and rinsings by burying in a non-crop, non-graze area away from all water supplies. If spill occurs on the ground collect the material and dispose of it as above. Treat affected area with decontamination solution and cover with clean soil.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**CYGON (dimethoate)  
Cyanimid/Chipman**

1. FORMULATIONS: Emulsifiable concentrates - Cygon 480E, Cygon 4-E and Cygon Hopper-Kill (480 g dimethoate/L).
2. HOW IT WORKS: Dimethoate is a broad-spectrum, systemic and contact, organophosphate insecticide and acaricide.
3. HOW TO APPLY:

**With:** Ground or air equipment.

<b>Rate:</b>	<b>Crop</b>	<b>Insect</b>	<b>mL/ac</b>	<b>(mL/ha)</b>
	barley, oats wheat (21)	Grasshoppers, thrips	220-400 400	(550-1000) (1000)
	alfalfa, clovers; pastures, waste areas	Aphids, young grasshoppers, leafhoppers, lygus bugs, plant bugs, alfalfa weevil larvae	170	(425)
		Adult (winged) grasshoppers	340-360	(850-900)
	Sweet clover	Weevil	340-450	(850-1100)
	Canola (21)	Aphids, grasshoppers	340-360	(850-900)
	Potato (7)	Aphids, leafhoppers	225-450	(550-1100)

Notes: 1. Grasshopper and sweet clover weevil control - when a range of rates is given, use the low rate for young insects, minor infestations or sparse foliage. Use the high rate for adult insects (winged grasshoppers and beetles), severe infestations or dense foliage.  
 2. Pre-harvest interval (days) given in brackets after crop.

**Cost:** \$8.75/L. Container size - 20 L, 4 L.

**Water Volume:** Use 18 L/ac (45 L/ha) for good coverage.  
 Potatoes - a minimum of 80 L/ac (200 L/ha).

**Protective Equipment:** Wear a respirator when exposure to spray cannot be avoided; wear goggles, rubber gloves and coveralls when handling concentrate.

4. SPRAYING TIPS: Apply when insects or damage first appears. Not suitable for application in oil.
5. GRAZING AND CROPPING RESTRICTIONS: Remove cattle prior to spraying. Pre-harvest interval is dependent upon the rate applied. When using 170-220 mL/ac (425-550 mL/ha), do not harvest or graze within 2 days. When using 340-360 mL/ac (850-900 mL/ha), do not harvest or graze forages within 7 days, or canola and grains within 21 days. When using 360-450 mL/ac (900-1100 mL/ha), do not harvest or graze within 28 days. Do not harvest potatoes within 7 days.
6. TOXICITY: Acute oral LD<sub>50</sub> = 320-380 mg/kg (rat)
7. PRECAUTIONS, FIRST AID: Wear protective equipment to avoid contact with skin and eyes. Do not inhale spray mist. Use in adequately ventilated area. Do not use or spill or store near heat or open flame. Do not use when bees are foraging. Symptoms of poisoning may include: nausea, vomiting, pinpoint pupils, excessive salivation, muscle twitching, convulsions and coma.

In case of contact - skin - wash thoroughly with soap and water - eyes - flush with water for 15 minutes; seek medical attention. If swallowed, drink one or two glasses of water and induce vomiting. Medical attention in all cases.

8. STORAGE: Store between 5°C and 30°C, away from feed and food.
9. DECONTAMINATION AND DISPOSAL: If accidental spillage should occur, scrub contaminated area immediately with a strong laundry soap solution or use household lye - detergents are not satisfactory for this purpose. Repeated scrubbings are necessary on plain wood surfaces.

Drain the container completely into the spray tank. Then rinse the container at least 3 times, filling at least one-quarter full with water each time and draining into the spray tank after each rinse. Crush or break the empty container and bury it with at least 0.5 m of cover and away from water supplies.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**DECIS (deltamethrin)**  
**Hoechst**

1. FORMULATIONS: Emulsifiable concentrate Decis 5 EC (50 g/L).
2. HOW IT WORKS: Deltamethrin is a non-systemic, synthetic pyrethroid which works by contact and ingestion.
3. NUMBER OF APPLICATIONS: One per year (alfalfa, cereals and flax); maximum of three per year (potatoes); repeat as necessary (canola and mustard).
4. APPLICATION:

**With:** Ground equipment only.

<b>Rates:</b>	<b>Crop</b>	<b>Insect</b>	<b>mL/ac</b>	<b>(mL/ha)</b>
	Alfalfa (seed production only)	Alfalfa weevil	100	(250)
		Lygus bugs	80-100	(200-250)
	Canola, mustard (both 14)	Flea beetles	40-60	(100-150)
	Potato (23)	Colorado potato beetle, tarnished plant bug, potato flea beetle	40-60	(100-150)
	Wheat, barley, flax, oats (all 50)	Cutworms Grasshoppers	80 40-60	(200) (100-150)

Notes: 1. Pre-harvest interval (days) given in brackets after crop.  
2. Use high rate for severe infestation, on dense foliage, or when adult insects are present.

**Cost:** \$75/L. Container size - 2.5 L.

**Water Volume:** alfalfa - 80-120 L/ac (200-300 L/ha); canola and mustard - 40 L/ac (100 L/ha); potatoes - 80-200 L/ac (200-500 L/ha); cereals and flax - 40 L/ac (100 L/ha) for cutworms, 40-80 L/ac (100-200 L/ha) for grasshoppers.

**Pressure:** 275 kPa

5. SPRAYING TIPS: Do not spray under a strong temperature inversion, or when temperature exceeds 25°C. Do not mix product with any other chemicals, additives or fertilizers. With severe flea beetle and grasshopper infestations, spray fence rows and a 15-meter strip into adjacent summerfallow and cropped fields. Apply to young (non-flying) grasshoppers for best results. Apply when insects or damage first appears.

6. GRAZING RESTRICTIONS: Do not graze treated fields. Do not feed treated crops to livestock, including crops damaged by hail.

7. TOXICITY: Acute oral LD<sub>50</sub> is 67 mg/kg (rat)

8. PRECAUTIONS, FIRST AID: Wear protective gear to avoid contact with skin and eyes - severe eye and skin irritant. Do not inhale. Keep away from fire, open flame and other sources of heat. Do not apply when bees are foraging.

Symptoms of poisoning include: neurological dysfunction, such as convulsion with severe poisoning.

This product contains xylene, DO NOT induce vomiting or administer liquids. In case of contact - skin - wash with soap and water; treat irritated area with Nivea cream - eyes - flush with water for 15 minutes.

9. STORAGE: Do not store below freezing. Do not store near feed or food.

10. DISPOSAL: Rinse empty containers with clean water at least three times, each time adding rinse water to spray tank. Crush rinsed containers and either bury at least 50 cm deep in loamy soil in a non-crop, non-graze area away from all water supplies or deliver to an approved land fill.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**DIAZINON (diazinon)**  
**Ciba - Geigy**

1. FORMULATIONS: Wettable powder (WP) - Diazinon 50W (50% diazinon).  
 Emulsifiable concentrate (EC) - Diazinon 500 (500 g diazinon/L).
2. REGISTERED MIXES: When using WP as a seed treatment for corn and sugarbeets, mix with a fungicide (75% Captan or 75% Thiram).
3. HOW IT WORKS: Diazinon is a non-systemic, organophosphate insecticide which works by contact and ingestion. Diazinon deteriorates rapidly in solution and in containers once opened.
4. NUMBER OF APPLICATIONS: Repeat as necessary.
5. APPLICATION:

**With:** Ground equipment.

<b>Rate:</b>	<b>Crop</b>	<b>Insect</b>	<b>Formulation</b>	<b>Qty/ac</b>	<b>(Qty/ha)</b>
	Potato (14)	Aphids, Colorado potato beetle, flea beetles, leafminers, leafhoppers	WP or EC	0.5 kg 0.5 L	1.1 kg (1.1 L)

Note: Pre-harvest interval (days) given in brackets after crop.

**Cost:** EC - \$12.50/L. Container size - 20 L, 4 L. W.P. - \$13.00/kg. Container size - 2 kg.

6. APPLICATION TIPS: Spray when insects first appear.
7. TOXICITY: Acute oral LD<sub>50</sub> is 250 mg/kg (rat)
8. PRECAUTIONS, FIRST-AID: Wear protective gear to avoid contact with skin or eyes - do not inhale spray mist. Toxic to bees, do not apply to crops in bloom.  
  
 Symptoms of poisoning may induce: headaches, dizziness, blurred vision, nervousness, weakness, nausea, cramps, diarrhea, discomfort in the chest, sweating, pinpoint pupils, tearing, salivation, vomiting, uncontrolled muscle twitching, convulsions, and coma.  
  
 If swallowed - give one to two glasses of water and induce vomiting; call a physician. In case of contact - skin - wash thoroughly with soap and water -eyes - flush with water for 15 minutes.
9. STORAGE: Do not store or use EC near heat or open flame. Flash point 27°C.
10. DECONTAMINATION AND DISPOSAL: Spills on concrete floors - surround and cover spill with a granular carrier such as Attaclay, (cat litter). Allow carrier to absorb the liquid, then shovel into a container for disposal by burying. Wash the floor with a weak lye solution to remove any trace of pesticide. Spills on wooden floors - use same procedure as for concrete floors but repeat washing until odor disappears.

Decontaminate equipment and empty containers by thoroughly rinsing with water; dispose of rinsings by burying in non-crop land away from water supplies. Crush, break or puncture empty containers and bury with rinsings or deliver them to sanitary landfill dumps.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**DYLOX (trichlorfon)**  
**Chemagro**

1. FORMULATIONS: Soluble Powder - (80% trichlorfon by weight)      Solution - (420 g trichlorfon/L)
2. HOW IT WORKS: Trichlorfon is an organophosphate insecticide which works by contact and ingestion.
3. NUMBER OF APPLICATIONS: Alfalfa - one per cutting. Barley, flax, oats, wheat - repeat as necessary prior to head emergence but not after flowering to flax; one additional application may be made to barley, oats and wheat after heads emerge from sheath. Canola, sugar beets - repeat as necessary. Corn (field, sweet) - maximum of three per season with either formulation.
4. APPLICATION:

**With:** Ground or aircraft equipment.

<b>Rate:</b>	<b>Crop</b>	<b>Insect</b>	<b>g/ac</b>	<b>Powder (g/ha)</b>	<b>L/ac</b>	<b>Liquid (L/ha)</b>
	Alfalfa (14)	Lygus bugs, stink bugs, tarnished plant bug	610	(1500)	1.1	(2.8)
	Barley, flax, oats, wheat (all 21)	Armyworms (common and true, western yellow-striped)	280	(700)	0.6	(1.5)
		Beet webworm variegated cutworm	280-610	(700-1500)	0.6-1.1	(1.5-2.8)
		Bertha armyworm	610	(1500)	1.1	(2.8)
	Canola (21)	Beet webworm	280	(700)	0.6	(1.5)
		Diamond back moth	610	(1500)	1.1	(2.8)
	Corn (field, sweet) (0)	Armyworms cutworms	280-610	(700-1500)	0.6-1.1	(1.5-2.8)
	Sugar beet (14)	Beet webworm	140-280	(350-700)	0.3-0.6	(0.7-1.5)
		Dipterous leaf miners, variegated cutworm	280-610	(700-1500)	0.6-1.1	(1.5-2.8)
		Beet armyworm	610-910	(1500-2250)	1.1-1.6	(2.8-4.0)

Notes: 1. Pre-harvest or pre-grazing interval (days) given in brackets after crop.  
 2. Where a rate range is specified, use the low rate for immature insects, light infestations or sparse foliage.  
 Exception - webworm control on sugar beets, use high rate with low volume aerial application.

**Cost:** \$8/L. Container size - 20 L.

**Water Volume:** Use sufficient water for thorough foliage coverage.

5. SPRAYING TIPS: Powder dissolves readily in water and is suitable for use in all power-operated ground sprayers and aircraft sprayers. To dissolve, pour the required amount into full amount of water and then agitate. Use immediately after mixing. Soluble powders should be used in sprayers equipped with 0.3 mm or larger screens. If 0.15 mm screens are used, some screen clogging may occur.

Trichlorfon is a selective insecticide: beneficial insect species are less affected. This selective advantage is lost when product is used in conjunction with or alternated with non-selective pesticides.

Corn - for early applications to control armyworms and cutworms, spray when plants are 7.5-30 cm high; direct the spray to the lower portions of the plant.

6. GRAZING RESTRICTIONS: Sugar beets - do not feed tops harvested within 28 days of treatment.
7. TOXICITY: Acute oral LD<sub>50</sub> = 144 mg/kg (rat)
8. PRECAUTIONS, FIRST AID: Wear protective gear to avoid contact with skin or eyes. Do not inhale spray mist. In case of contact - skin - wash thoroughly with soap and water - eyes - flush with water for 15 minutes. If swallowed administer milk or water freely and induce vomiting by giving one dose (15 mL) of syrup of ipecac or by stimulating the back of the throat with a finger.
9. STORAGE: Store the liquid formulations above 0°C and away from excessive heat and open flame. Store in an area specially designated for pesticides. Do not store near any material intended for use of or consumption by humans or animals.

**\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\***

**FURADAN (carbofuran)**  
**Chemagro**

1. FORMULATIONS: Granular - 10G and CR-10 (10% carbofuran). Flowable - (480 g carbofuran/L.)
2. REGISTERED MIXES: Flowable formulation may be tank-mixed with phenoxy ester or amine herbicides and should be used only on crops listed on both labels. Compatible with most fungicides. Do not mix with Bordeaux or hydrated lime.
3. HOW IT WORKS: Carbofuran is a broad-spectrum, systemic, carbamate insecticide, acaricide and nematicide.
4. NUMBER OF APPLICATIONS: Granular - one per season. Flowable: Oilseeds - for flea beetle control, one application at 110 mL/ac (275 mL/ha) or two applications totalling not more than 110 mL/ac (275 mL/ha). Grains and forages - two applications at 110 mL/ac (275 mL/ha) or, for alfalfa weevil, one at 225 mL/ac (550 mL/ha). Corn - four applications for corn borer. Potatoes - repeat as necessary.

**5a. APPLICATION: Granular**

<b>Rate:</b>	<b>Crop</b>	<b>Insect</b>	<b>Formulation</b>	<b>kg/ac</b>	<b>(kg/ha)</b>
	Canola, mustard	Flea beetles	CR-10	1.1	(2.8)
	Potato	Colorado potato beetle, potato flea beetle, leafhoppers	10G using 90 cm row spacing or 300 g/100 m of row.	13.2	(32.5)
	Sugar beet	Sugar beet root maggot	10G	3.4	(8.5)

**Cost:** CR10 - \$4.40/kg. Container size - 20 kg. - 10-G - \$3.50/kg - Container size - 20 kg.

Note: - Use the high rate if a severe infestation is anticipated.

**Incorporation:** Canola, mustard - for seed drill application only; not valid for application with disc harrows. Do not harrow after seeding. Mix granules and seed thoroughly. Check for accurate calibration.

Potatoes apply as a 10 cm wide band into seed furrow or drill into the soil 10 cm on each side of row and 5 cm below seed.

Sugar beets - apply directly into seed furrow at same depth as seed or slightly above seed. Do not mix seed, fertilizer and insecticide in same hopper.

**5b. APPLICATION: Flowable**

**With:** Ground or aircraft equipment.

<b>Rate:</b>	<b>Crop</b>	<b>Insect</b>	<b>mL/ac</b>	<b>(mL/ha)</b>
	Alfalfa (7)	Alfalfa weevil	225	(550)
	Alfalfa (1), barley (21), canola (60), corn - sweet (7), (7), field (3), flax (21), mustard (21), oats (21), pasture (1), sweet clover (28), wheat (21)	Grasshoppers	110	(275)
	Canola (60), mustard (21)	Flea beetles	60-110	(150-275)
		Red turnip beetle	110	(275)
	Corn (field, silage, sweet) (7)	European corn borer	445	(1100)
	Potato (7)	Any of: aphids, potato flea beetle, potato leafhopper or tarnished plant bug alone or in combination with Colorado potato beetle.	445	(1100)
	Potato (7)	Colorado potato beetle	225	(550)

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

Notes: 1. Pre-harvest or pre-grazing interval (days) given in brackets after crop.  
2. Canola - use the high rate for severe infestations.  
3. Potatoes - use 690 mL/ac (1.75 L/ha) if large numbers of aphids are present.

**Cost:** \$20/L. Container - 4 L.

**Water Volume:** Ground application - not less than 40 L/ac (100 L/ha), use sufficient water for thorough coverage. Aerial application - not less than 20 L/ac (50 L/ha). Potatoes - use 325-405 L/ac (800-1000 L/ha) at a minimum pressure of 275 kPa.

6. **SPRAYING TIPS:** Check the label for calibration of various types of granular applicators. If seed decay, seedling blight or damping-off diseases are a problem, treat seed with a recommended fungicide. Canola and mustard may also require a foliar treatment after seeding with granules. Check fields shortly after emergence.

Alfalfa - apply when 25% of tips show feeding damage by alfalfa weevil. In general, apply foliar sprays when insects or feeding damage first appears. Boom sprayers - equipped with hydraulic or mechanical agitation and 0.3 mm screens; remove any felt filters.

7. **GRAZING RESTRICTIONS:** Sugar beet tops and pulp may be fed to livestock without causing residues in milk or meat.

8. **TOXICITY:** Acute oral LD<sub>50</sub> = 11 mg/kg (rat).

9. **PRECAUTIONS, FIRST AID:** Wear coveralls at all times. Never handle product with bare hands - use rubber or neoprene gloves - do not use leather gloves. Change clothes each day - wash clothes in detergent, bleach and hot water. Take a bath at the end of each day. Do not breathe spray mist or dust. Wear goggles at all times.

Symptoms of poisoning include blurred vision, nausea, excessive perspiration, weakness, headache, light-headedness, constriction of pupils, cramps, salivation and vomiting. In case of contact - skin - wash thoroughly with soap and water - eyes - flush with water for 15 minutes. If swallowed, give milk or water freely and induce vomiting by giving one dose (15 mL) of syrup of ipecac. Repeat dosage in 15-20 minutes if vomiting does not occur. Sticking a finger down the throat will induce vomiting if syrup of ipecac is not available. Repeat until vomit is clear. Victim should be lying face down or on the side with head below foot level. Secure medical attention immediately.

10. **STORAGE:** Protect flowable from freezing.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

## GASTOXIN, PHOSTOXIN (phosphine) Phoenix

1. FORMULATIONS: 3 g tablets (release 1 g phosphine upon decomposition). 0.6 g pellets (release 0.2 g phosphine upon decomposition).
2. MARKETING CATEGORY: Restricted. A permit must be obtained from your local Agricultural Fieldman or Alberta Environment prior to purchase or use of these products.
3. REGISTERED USES: Raw agricultural products, grain, processed foods and feeds.
4. HOW IT WORKS: Phosphine (hydrogen phosphide) is a colourless gas with a carbide-like odour and high volatility. Formulated product consists of aluminium phosphide, ammonium bicarbonate, urea and paraffin. Upon exposure to air, the ammonium bicarbonate breaks down to form ammonia (a pungent, warning gas) and carbon dioxide (a fire suppressant). Within one to four hours, depending on temperature and humidity, the product begins to release phosphine and decompose. The effectiveness of fumigation is primarily dependent upon temperature, tightness of seal, the type of storage space, exposure time and dosage.
5. INSECTS CONTROLLED: Granary and rice weevils, saw-toothed grain beetle, flat or rusty grain beetle, khapra beetle, lesser grain borer, flour beetles, cadelle, dried fruit moth, Mediterranean flour moth, Angoumois grain moth, Indian meal moth, almond moth, bean weevil, dermestids, raisin moth and tobacco moth.
6. APPLICATION:

**Rate:** Raw agricultural commodities, grain and bulk animal feeds - 4-6 tablets per cubic metre (60-180/1000 bu.), or 5-10 pellets per cubic metre (120-300 pellets/1000 bu.).

Processed foods - 16 tablets per 10 cubic metres (30-60 tablets/1000 cubic ft.) or 6 pellets per cubic meter (100-200/1000 cubic ft.) of storage space.

**Cost:** \$54/can of 300 tablets.

<b>Exposure Time:</b>	<b>Commodity temp. °C</b>	<b>Exposure time (tablets)</b>	
	over 20	3 days	
	16-20	4 days	pellets one
	12-15	5 days	day less
	5-11	10 days	
	Do not fumigate	below 5	

**Protective Equipment:** It will be necessary to wear a gas mask if: (i) a structure under fumigation must be entered in case of emergency or (ii) a structure must be entered to commence aeration procedure. Otherwise, it is not necessary to wear a gas mask when product is applied according to label directions. Wear gloves when handling the product.

7. APPLICATION TIPS: *General:* Never fumigate alone. Have appropriate gas detection devices available for use as needed. Never fumigate any structure or area unless it is unoccupied. Aerate finished food for 48 hours before it is offered to the consumer.

*For Fumigating Flat Storages (Quonsets, granaries):* Make certain that the structure is tight enough to be fumigated successfully. Seal structure as needed. Make certain that there are no adjoining structures occupied by man or animals.

During fumigant application leave all doors or other openings open to create a cross ventilation. Application can proceed for 2-4 hours or until the odor of phosphine is detected in the overspace. Apply the tablets or pellets by using a probe. Make probes every 4-5 feet (1.0-1.5 m) horizontally across the grain in both directions. The number of tablets or pellets used per probe is determined by dividing the amount of fumigant to be used by the number of probings to be made. The fumigant is dropped in the probe at intervals as the pipe is withdrawn from the grain.

A plastic tarp may be pulled over the grain surface following application. This reduces convection currents and increases the effectiveness of the fumigant. Care must be taken to see that the plastic is removed when the fumigation is completed (no more than 5-6 days or sweating of the grain may occur).

Close and seal all external openings. Placard and lock all entrances. Following the exposure period, open doors and windows creating a cross draft to aid in aeration. Make certain all warning signs are removed when aeration is complete.

*For Fumigation of Railcars:* Boxcars and hopper cars of bulk raw agricultural commodities and animal feeds are fumigated in the same manner as are silos or flat storages. The tablets or pellets may be added to the commodity as it flows into the railcars, placed on the floor of the empty car, placed on the surface of the commodity, or probed after loading is completed.

Processed foods and bagged raw commodities and animal feeds are fumigated by placing the tablets or pellets in moisture permeable envelopes or on trays which in turn are fastened to a substantial support within the car. Care must be taken to see that the fumigant or its reacted residue does not come in contact with processed foods.

Close and seal all hatches or doors. Approved warning signs must be applied to each door of box cars and near the ladder on hopper cars as well as on the top hatch covers. Date signs as to when fumigation commenced and when the car may be opened. Notify the consignee that the car is to be received under fumigation.

*For Fumigating Silo Type Storages (Granaries):* Calculate required number of tablets or pellets based on dosage selected and quantity of commodity to be treated. Open all containers outside the building.

Tablets may be applied to grain on the transfer belt by hand. Pellets are best applied using an automatic pellet dispenser. They may be dispensed into the up leg of the elevator from the workroom floor, or onto the grain as it travels along the transfer belt on the bin floor.

**\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\***

8. PRECAUTIONS, FIRST AID: Symptoms of poisoning: Severity is dependent on concentration of hydrogen phosphide involved. Mild poisoning results in fatigue, nausea, pressure or pain in the chest, ringing in the ears, and uneasiness. Hydrogen phosphide is not a chronic poison, and these symptoms will readily disappear with rest and fresh air.

Greater quantities of gas produce such symptoms as vomiting, stomachache, diarrhea, disturbance in equilibrium, and dyspnea (difficulty in breathing). Very high concentrations quickly cause bluish-purple skin color, agitation, poor muscle co-ordination, sub-normal blood oxygen content, unconsciousness and death. Death can occur very quickly, or be delayed several days as a result of pulmonary edema and collapse, by paralysis of the central respiratory system. In cases of severe poisoning, disturbance in liver and kidney function can also occur.

First aid: Should exposure to hydrogen phosphide be documented or suspected:

- Remove patient from gas atmosphere to open air.
- Call a physician immediately.
- Have patient lay down, keeping him warm and comfortable. Treat as for shock.
- Make no antidotal use of fats, oil, butter, or milk. Do not administer atropine as it is contraindicative.
- Commence artificial respiration if breathing has ceased.
- When exposure to low concentrations of hydrogen phosphide have been documented or suspected, the individual involved should rest for 24 hours and under no circumstances should he resume any work dealing with fumigation.

9. PRECAUTIONS: Hydrogen phosphide gas is very toxic to all forms of animal life, and exposure to even small amounts should be prevented. Poisoning results from ingestion or inhalation as hydrogen phosphide is not absorbed through the skin. It is also insoluble in water, fats, and oils.

Open containers only in open air and with the opening pointing away from your face. Wear gloves when handling the product. Use entire contents of a tube once it is opened. Unopened tubes and resealable flasks may be returned to the locked storage area for later use. Wash hands after use of the product.

Never let tablets or pellets come in direct contact with liquid - this causes the immediate release of hydrogen phosphide. Never confine the product in small gas proof enclosures such as plastic bags. Such confinement could cause the gas concentration to reach the lower flammability level. Take precautions in areas where copper, brass or gold are present, as corrosion may occur. Never fumigate in areas containing electronic or telephone equipment, photographic film or copy paper. It may be possible to remove such items or protect them from exposure to the gas. Suggested exposures should be observed. A shortened exposure period cannot be compensated for by increased dosage. Hydrogen phosphide has great penetrating power and gas may slowly seep through concrete block walls. See that adjoining areas are not used as living quarters during the fumigation period. Hydrogen phosphide does not layer, but expands to fill the available space. Because of its high volatility and penetrating ability, the enclosure being treated must be sealed as tightly as possible if an effective fumigation is to be expected.

10. STORAGE: Tablets and pellets are received in wooden cases containing sealed tubes and cans, or resealable flasks. As long as the tubes, cans or flasks remain intact, the storage life of the product is unlimited. Storage should be in a dry, locked, ventilated area and out of the reach of children and irresponsible persons.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**GUTHION (azinphos-methyl)**  
**Chemagro**

1. FORMULATIONS: Spray concentrate (SC) - (240 g azinphos-methyl/L)  
Wettable powder (WP) - (50% azinphos-methyl)
2. HOW IT WORKS: Azinphos-methyl is a contact, non-systemic, organophosphate insecticide and acaricide.
3. NUMBER OF APPLICATIONS: One per season on barley, oats, rye, sugar beets, wheat. One per season on alfalfa and clover except two per season for sweet clover weevil control or when using rates of 910 mL SC/ac (2.25 L SC/ha) or less. Repeat as necessary on canola and potatoes.
4. APPLICATION:

**With:** Ground or aircraft equipment.

**Rate:**

<b>Crop(*)</b>	<b>Insect</b>	<b>Liquid</b>		<b>Powder</b>	
		<b>Qty/ac</b>	<b>(Qty/ha)</b>	<b>Qty/ac</b>	<b>(Qty/ha)</b>
Alfalfa (21), Clover (21)	Alfalfa plant bug, alfalfa weevil, aphids, leafhoppers, lygus bugs, sweet clover weevil	0.9-1.4 L	(2.3-3.5 L)	445-710 g	(1100-1750 g)
Canola (30)	Diamondback moth	0.23-0.5 L	(0.6-1.3 L)	110-225 g	(275-550 g)
	Flea beetles	0.11-0.225 L	(0.28-0.55 L)	60-110 g	(150-275 g)
Canola (30)	Red turnip beetle	0.23-0.35 L	(0.55-0.85 L)	110-170 g	(275-425 g)
Potato(7)	Aphids Colorado potato beetle	1.4 L 0.5-0.7 L	(3.5 L) (1.3-1.8 L)	710 g 225-345 g	(1800 g) (550-850 g)
Potato(7)	Flea beetle, leafhoppers, spittle bug, tarnished plant bug	0.9-1.4 L	(2.3-3.5 L)	445-710 g	(1100-1800 g)
Sugarbeet (100)	Flea beetles	0.11 L	(0.28 L)	60 g	(150 g)

\*Notes: — Pre-harvest interval (days before cutting for food, feed or forage) given in brackets after crop.  
— Rate range - use the low rate on immature insects, light infestations or sparse foliage.

**Cost:** \$9.50/L. Container size - 20 L.

**Water Volume:** Use sufficient water for thorough coverage - generally, a minimum of 32 L/ac (80 L/ha) with ground equipment and 16 L/ac (40 L/ha) with aerial application. Alfalfa weevil - use 60-80 L/ac (150-200 L/ha) on heavy growth.

**Nozzles:** When spraying canola and sugar beets, wettable powder may be applied using any commercial tractor, or drawn or self-propelled field sprayer provided it is equipped with the following:

- (i) nozzle tips no finer than 6502, 8002 or TK2 with nozzle screens no finer than 0.3 mm. The above tips will provide 40 L/ac (100 L/ha) when operated at 8 km/hr and 200 kPa.
- (ii) 0.3 mm or larger line strainers or screens. Note that felt filters, smaller nozzle tips or smaller screens will become clogged when using the wettable powder formulation.

5. SPRAYING TIPS: For red turnip beetle, spray an 18-30 m wide band around the field or where beetles are causing damage. Repeat as necessary.

**Mixing:** The wettable powder mixes easily with water. Mix the required amount of powder with a small quantity of water. Add this pre-mix through the screen while filling the sprayer tank or fill the tank to the required level and then add the pre-mix. Operate the agitator while mixing.

The spray concentrate forms an emulsion when diluted with water and is suitable for use in all power-operated ground sprayers and aircraft sprayers. To mix, pour the required amount of spray concentrate into full amount of water and then agitate.

6. GRAZING RESTRICTIONS: Do not graze treated areas within 21 days of application.

7. TOXICITY: Acute oral LD<sub>50</sub> = 11 mg/kg (rat)

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

## 8. SAFETY:

*Symptoms of poisoning:* A sense of "tightness" in the chest, sweating, contracted pupils, stomach pains, vomiting and diarrhea.

*Toxicological information (for the physician):* Compound inhibits cholinesterase, resulting in stimulation of the central nervous system, the parasympathetic nervous system, and the somatic motor nerves. Do not give morphine. Watch for pulmonary edema which may develop in serious cases of poisoning even after 12 hours. At first sign of pulmonary edema, the patient should be placed in an oxygen tent and treated symptomatically.

**Antidote:** - Administer atropine sulfate in large therapeutic doses. Repeat as necessary to the point of tolerance. 2-PAM is also antidotal and may be administered in conjunction with atropine.

*First aid:* In case of poisoning call a physician immediately. Have patient lie down and keep quiet.

**IF SWALLOWED:** - vomiting should be induced. Administer water freely and induce vomiting by giving one dose (15 mL) of syrup of ipecac. If vomiting does not occur within 10-20 minutes, administer second dose. If syrup of ipecac is not available, induce vomiting by sticking finger down throat. Repeat until vomit fluid is clear. The patient should be lying down with the head below the foot level and facing down or to one side. Professional medical assistance should be secured immediately. Do not induce vomiting in an unconscious or convulsive person.

**IF ON SKIN** - remove contaminated clothing and wash skin immediately with soap and warm water.

**IF IN EYES** - wash immediately with flowing water for at least 15 minutes.

## 9. PRECAUTIONS: KEEP OUT OF REACH OF CHILDREN.

Poisonous if swallowed, inhaled, or absorbed through the skin. Do not get in eyes or on skin. Wear protective clothing, natural rubber gloves, and goggles. Do not breathe dust or spray mist. Wear a pesticide respirator.

Do not contaminate feed or food. Keep all unprotected persons out of the operating area or vicinity where there may be danger of drift. Workers who must enter treated fields within 2 days of application should wear protective clothing. Wash hands, arms, and face thoroughly with soap and warm water before eating or smoking. Wash all contaminated clothes with soap and hot water before reuse.

Do not use on other crops used for food or forage. Use only according to label directions. Application at rates above those shown may result in illegal crop residues. Do not use on food crops grown in the greenhouse. To protect fish and wildlife, do not contaminate streams, lakes, or ponds. This product is highly toxic to bees exposed to direct treatment or residues on crops. Do not apply when crop is in bloom or allow spray to drift towards beehives.

**10. STORAGE:** Do not store spray concentrate below -4°C. Protect products from heat and open flame. Do not heat.

**11. DECONTAMINATION AND DISPOSAL:** Do not reuse container. Completely empty the container. Rinse empty drum by filling with water and adding 250 mL household lye/25 L water; punch holes in top and bottom and crush. Bury unused chemical, rinse solution and crushed container at least 50 cm deep in a non-crop, non-graze area away from water supply.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**LANNATE; NUDRIN (methomyl)**  
**Du Pont**

1. FORMULATIONS: Solutions — Lannate L (215 g methomyl/L)  
 — Nudrin (216 g methomyl/L)
2. HOW IT WORKS: Methomyl is a carbamate insecticide which works by contact and ingestion and has some systemic action. Rapidly degraded in green, growing plants; short-term residual. Rapid knock-down.
3. NUMBER OF APPLICATIONS: As needed, no restriction on number of application per season.
4. APPLICATION:

**With:** Ground equipment (all-crops) or aircraft (canola, flax, wheat, oats and barley).

<b>Rate:</b>	<b>Crop</b>	<b>Insect</b>	<b>L/ac</b>	<b>(L/ha)</b>
	Canola (8)	Alfalfa looper, bertha armyworm, beet webworm, clover cutworm	0.4-0.5	(0.9-1.3)
	Corn, sweet (3)	Corn earworm European corn borer	0.8-1.1 1.1	(1.8-2.8) (2.6)
	Flax (8)	Bertha armyworm, flax bollworm	0.4-0.5	(0.9-1.3)
	Potato (3)	Aphids, flea beetles, leafhoppers	0.9	(2.3)
	Wheat (20), oats (20), barley (20)	Common armyworm Thrips	0.5-0.9 0.5	(1.3-2.3) (1.3)

Notes: 1. Pre-harvest interval (days) given in brackets after crop.

2. When a rate range is specified, use the low rate only for very young insects, small plants or light infestations.

**Cost:** \$12/L. Container size - 18.9 L

**Water Volume:** Ground spray - use 20-60 L/ac (50-150 L/ha); Aerial spray - use a minimum of 16 L/ac (40 L/ha).

5. SPRAYING TIPS: Apply at the recommended rates in sufficient water to obtain thorough, uniform coverage. Best control is obtained when spray schedules are initiated on young insects. Repeat application as necessary. Early morning or late evening sprays are recommended.

On sweet corn - for earworm, spray whorls as needed and silks at 2-4 day intervals or as needed; for European corn borer consult your district agriculturist - spray at 3-5 day intervals or as needed when insects first appear.

6. TOXICITY: Acute oral LD<sub>50</sub> = 17 mg/kg (rat)
7. PRECAUTIONS, FIRST AID: Wear a respirator and protective gear to avoid contact with skin and eyes. May cause blindness if swallowed or inhaled. Extremely flammable. Use in an adequately ventilated area. Aircraft pilot should not assist in the mixing and loading operation. Toxic to bees, apply when bees are not foraging.

Symptoms of poisoning may include weakness, blurred vision, headache, nausea, abdominal cramps, discomfort in the chest, constriction of pupils, sweating, slow pulse, and muscle tremors.

Atropine is an antidote - consult physician for an emergency supply of 1/100 grain atropine tablets. In case of contact - skin - wash thoroughly with soap and water - eyes - flush with water for at least 15 minutes. Medical attention is necessary in all cases. If symptoms appear before a physician arrives, immediately swallow two atropine tablets (each 1/65 mg); thereafter, every 10-15 minutes, take one atropine tablet until the throat becomes dry and the skin become dry and flushed. Take additional tablets as necessary to maintain a moderately dry throat and dry, flushed skin until a physician is available.

8. STORAGE: Do not store below 0°C. Above 136°C, product decomposes and may explode if confined.
9. DECONTAMINATION AND DISPOSAL: Spill or Leak Procedure. Do not get in eyes, on skin or clothing. Keep people away and upwind of spill/leak. If necessary to enter the spill area, wear self-contained breathing apparatus, gloves, boots and protective clothing. Try to remove leaking containers and put them into leak-proof containers. Sweep up spills; apply earth, sand or sweeping compound to spill area and re-sweep to pick up residue. Package spill material in plastic, cardboard or metal containers; bury in a safe place away from water supplies. If product enters crevices and cannot be effectively swept, treat with a sodium hydroxide (Drano) water solution and allow to stand 4 hours. Thereafter, flush well with water; do not flush into any body of water. If product enters sewers or bodies of water, notify appropriate local and federal authorities.

NOTE: Sodium hydroxide causes burns. Do not get in eyes, on clothing. In case of contact, flush eyes or skin with plenty of water; call a physician. When handling, wear goggles in addition to boots and gloves.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**LINDANE (gamma BHC)**  
**Chipman**

1. FORMULATIONS: Dusts (12-75% gamma BHC by weight), Solutions (15.7-21.5%), Suspensions (10-49.9%), Wettable powders (16.6-50%)
2. REGISTERED MIXES: Most commercial formulations of lindane for seed treatment are mixed with one, two or three fungicides (any of: benomyl, captan, carbathiin, maneb, TCMTB, thiram). The insecticide diazinon is added to some.
3. HOW IT WORKS: Lindane is an organochlorine insecticide which works by ingestion and contact.
4. APPLICATION:

**With:** Seed treater or as a drill-box mix.

<b>Rate:</b>	<b>Crop</b>	<b>Insect</b>	<b>Rate</b>
	Canola, cereals, corn, sugar beets, (seed treatments)	Flea beetles, wireworms	Varies with formulation; follow label for specific dosage.

**Cost:** Varies depending on formulation and combination with insecticides.

5. APPLICATION TIPS: Use mineral oil or linseed oil as a sticker (150 mL/25 kg seed) (6 mL/kg) when applying the high rate of dust as a seed treatment for severe flea beetle infestation by:

- (i) mixing oil and seed to coat,
- (ii) mixing again with dust, and
- (iii) using planting equipment that can be satisfactorily adjusted to compensate for the increased coating on the seed.

6. GRAZING: Do not use treated seed for feed, food or oil processing. Do not graze or feed livestock on treated areas for four weeks after planting

7. TOXICITY: Acute oral LD<sub>50</sub> = 88-91 mg/kg (rat)

8. PRECAUTIONS, SYMPTOMS OF POISONING, FIRST AID: Wear protective gear to avoid contact with skin or eyes. Do not inhale dust. Work in a well ventilated area. Change clothes daily. If treated seed is to be stored label as "Poisonous to man and animals. Do not use as feed. This seed is treated with Lindane for control of insects."

*Symptoms of poisoning may include:* nausea, vomiting, hyper-irritability, convulsions, and coma. In case of contact - skin - remove contaminated clothing and wash skin with soap and water - eyes - flush with water for 15 minutes and get medical attention. If swallowed - induce vomiting by sticking a finger down the throat or by giving syrup of ipecac. Obtain medical attention immediately.

9. STORAGE: Liquid products may be frozen; crystals will dissolve when warmed to 0°C.

**LORSBAN (chlorpyrifos)**  
**Dow**

1. FORMULATIONS: Emulsifiable concentrate - Lorsban 4E (480 g chlorpyrifos/L).
2. HOW IT WORKS: A broad-spectrum, non-systemic insecticide. Works by contact, ingestion and vapour action.
3. NUMBER OF APPLICATIONS: Once per season as (i) a foliage treatment of barley, oats, wheat and canola, (ii) as a seedling or soil treatment of potatoes and (iii) as a seedling treatment of canola, flax, sugar beet and sunflower. Not more than 9 weekly applications on potato foliage.
4. APPLICATION:

**With:** Ground (all) or aerial equipment (canola and flax)

<b>Rate:</b>	<b>Crop</b>	<b>Insect</b>	<b>mL/ac</b>	<b>(L/ha)</b>
	Seedling potatoes and corn (both 70)	Cutworms	490-970	(1.2-2.4)
	Seedling canola, flax (both 21) seedling sugar beet (90)	Cutworms	350-490	(0.9 -1.2)
	Seedling sunflower (90)	Cutworms	490	(1.2)
	Foliage: barley, oats, wheat (all 60)	Armyworm, cutworms	350-490	(0.9-1.2)
	Foliage: potato (7)	Potato flea beetle, tarnished plant bug, Colorado potato beetle	400	(1)
	Foliage: canola (21)	Bertha armyworm, alfalfa looper	300-400	(0.8-1.0)
		Common armyworm, grasshoppers	350-400	(0.9-1.0)

Notes: 1. Pre-harvest interval (days) given in brackets after crop.  
 2. Rate range - use low rate for young insects, light infestations or sparse foliage.

**Cost:** \$14.50/L. Container size - 18.9 L.

**Water Volume:** Seedling canola and flax - 32-80 L/ac (80-200 L/ha) by ground; 4-8 L/ac (10-20 L/ha) by air; seedling sugar beet and sunflower -32-80 L/ac (80-200 L/ha); barley, oats and wheat foliage - 20-80 L/ac (50-200 L/ha); potato foliage - 160-325 L/ac (400-800 L/ha); rape foliage -16 L/ac (40 L/ha) by ground, 4 L/ac (10 L/ha) by air; all other applications require 80-160 L/ac (200-400 L/ha).

5. SPRAYING TIPS: Use the higher rates when the top 1 cm of soil surface is extremely dry or when the infestation is heavy or when foliage is dense. Early evening applications are best. Apply when damage first appears.
6. TOXICITY: Acute oral LD<sub>50</sub> = 135-163 mg/kg (rat)
7. PRECAUTIONS, SYMPTOMS OF POISONING, FIRST AID: Wear protective gear to avoid contact with skin or eyes. Do not inhale vapours or spray mist. Toxic to bees, do not apply to blooming crops.

Symptoms of poisoning by inhalation include: stuffy, runny nose, scratchy throat, asthmatic wheezing, sudden bronchospasm, swelling of oral and laryngeal mucous membranes, shock. In case of contact - skin - wash thoroughly with soap and water - eyes - flush with water for 15 minutes and get medical attention. If swallowed - do not induce vomiting, get medical attention immediately.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**MALATHION, CYTHION (malathion)**  
**Cyanimid**

1. FORMULATIONS: Emulsifiable concentrates - 500E, 500, 50% (500 g malathion/L). Grain Protectant - Liquid (1 kg malathion/L). Deodorized - Dust (2% malathion).
2. HOW IT WORKS: Malathion is a non-systemic, contact, organophosphate insecticide and acaricide of brief to moderate persistence. Generally non-phytotoxic. Not effective below 20°C (does not apply for control of stored grain insects).

**3a. APPLICATION: Emulsifiable Concentrates**

**With:** Ground equipment or aircraft equipment.

<b>Rate:</b>	<b>Crop</b>	<b>Insect</b>	<b>L/ac</b>	<b>(L/ha)</b>
	Alfalfa (7), clover (7),	Alfalfa weevil larvae, aphids grasshoppers, leafhoppers, lygus bugs, spittle bug adults	0.9-1.1	(2.3-2.8)
	Canola (7), mustard (7)	Flea beetles, grasshoppers	0.4-0.7	(1.1-1.8)
		Diamondback moth larvae	0.2-0.3	(0.6-0.9)
	Flax (7), pastures (0)	Grasshoppers	0.4-0.7	(1.1-1.8)
	Cereals (7), hay (7)	Grasshoppers	0.7	(1.7)
		English grain aphid,	0.8-1.1	(2.0-2.8)
	Potato (3)	Aphids, Colorado potato beetle, leafhoppers	0.6-0.8	(1.5-2.0)
	Sugar beet	Flea beetles	0.4	(1.1)
	Sweet clover	Sweet clover weevil	0.6-1.0	(1.5-2.5)

Notes: 1. Pre-harvest or pre-grazing interval (days) in brackets following crop.  
2. Rate ranges: use low rate for immature insects, light infestations or sparse foliage.

**Cost:** \$5/L. Container size - 20 L, 4 L.

**Water Volume:** For potato pests, use recommended rate in 400 L/ac (1000 L/ha) finished spray.

**3b. APPLICATION: Grain Protectants**

**With:** Spray or dust application.

<b>Rate:</b>	<b>Insect</b>	<b>Grain</b>	<b>Qty/1000 Liquid</b>	<b>kg Grain Dust</b>
	Flour and grain beetles, grain mites	Barley Corn Oats Rye Wheat	12 mL 10 mL 17 mL 10 mL 10 mL	520 g  735 g 450 g 415 g
	Indian meal moth	Barley, corn, oats, rye, wheat	300 mL/100 m <sup>2</sup> of grain surface	

Notes: 1. Stored grain should not be offered for sale until 7 days after treatment.

**Cost:** \$2/kg. Container size - 20 kg bag.

**Water Volume:** For Indian meal moth, use the recommended rate in 5-10 L water. For all other pests, use the recommended rate in 10-20 L water.

**Incorporation:** Scatter proper amount of dust on each load and cut in with shovel before dumping or add grain as it is being augered.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

#### 4. SPRAYING TIPS:

*Alfalfa and clover:* apply when about 75% of foliage shows weevil feeding damage. Do not apply when crop is in bloom. Sugar beet: apply at 3-5 leaf stage when insects or damage first appears.

*Sweet clover:* spray field margins of first year clover in late summer or early fall when migration of weevil adults is occurring.

*All crops:* Apply when day temperature is expected to exceed 20°C.

*Stored Grain:* to protect from attack by Indian meal moth, apply spray evenly over the surface of clean or uninfested grain and rake to a depth of 15 cm. Apply immediately after grain is loaded into storage. For control of pests in grain on the farm, where special application equipment is not available, any type of low pressure sprayer holding 5 L or more can be used. The spray can be applied to the grain stream as the grain is being elevated into storage. First, test sprayer calibration by discharging into a tank of water, then regulate the flow of grain to get the proper rate of spray. Keep spray coarse to avoid loss as "drift".

Before storing new grain, thoroughly clean up old grain and debris from bins, elevators, or grain handling equipment. Remove and burn all sweepings. After cleaning the premises, apply a residual malathion spray to walls, floors and machinery in grain elevators or farm storage, using a solution containing 200 mL Grain Protectant/5 L water. Make sure the spray is forced into cracks and crevices. Apply at the rate of 5 L of spray per 100 m<sup>2</sup> of surface area using a coarse wetting spray. Wait until spray has thoroughly dried before storing grain in treated areas. This same spray should be applied around the outside of bins and elevators to help prevent re-infestation.

5. GRAZING RESTRICTIONS: Forages and pasture: remove cattle before spraying; cattle may be returned immediately after spraying.
6. TOXICITY: Acute oral LD<sub>50</sub> = 2800 mg/kg (rat)
7. PRECAUTIONS, SYMPTOMS, FIRST AID: Wear protective gear to avoid contact with skin or eyes - do not inhale vapour, spray mist or dust. Toxic to bees, do not apply to plants in bloom.

Symptoms may include headache, weakness, sweating, giddiness, blurred vision, nausea, abdominal cramps, diarrhea, and discomfort in chest.

In case of contact - skin - wash thoroughly with soap and water - eyes - flush with water for 15 minutes. If swallowed - induce vomiting by sticking a finger down the throat - get medical attention.

8. DECONTAMINATION: Malathion breaks down rapidly in the presence of water and alkaline materials. Containers and spillages can be readily decontaminated by use of Javex or lye, or washing soaps containing sodium hydroxide. Residues of malathion can be buried in a suitable disposal area. First, place a layer of soda ash or hydrated lime at the bottom of a pit, then pour in the malathion, add another layer of soda ash or lime. Finally, cover with a mixture of Javex and water and top with soil. The amount of soda ash or lime and Javex will be dependent upon the amount of malathion to be decontaminated.

**METHOXYCHLOR, MARLATE (methoxychlor)**  
**Du Pont**

1. FORMULATIONS: Emulsifiable concentrates - (240 g methoxychlor/L)
2. REGISTERED MIXES: Methoxychlor and a fungicide (e.g. captan)/seed treatments.
3. HOW IT WORKS: Methoxychlor is a non-systemic, organochlorine insecticide which works by contact and ingestion. Not for aphids or mites  
Short residual.
4. NUMBER OF APPLICATIONS: Repeat as necessary at intervals of 7-10 days (alfalfa and clover with insects other than armyworm, potatoes); 7-14 days (for armyworm on alfalfa, clover, wheat, oats, rye, barley and corn).
5. APPLICATION:

**With:** Ground or aircraft equipment.

<b>Rates:</b>	<b>Crop</b>	<b>Insect</b>	<b>L/ac</b>	<b>(L/ha)</b>
	Alfalfa, clover	Alfalfa weevil, sweet clover weevil, flea beetles, leafhoppers, grasshoppers	2.0-2.6	(5.0-6.3)
	Alfalfa, clover, wheat, corn, oats, barley, rye	Armyworm	2.8-4.9	(7.0-12.0)
	Potato	Blister beetle, Colorado potato beetle, flea beetles, leafhoppers	1.3-4.3	(3.3-10.5)

Notes: 1. Pre-harvest or pre-grazing interval for foliage application is 7 days for crops listed.  
 2. Rate range - use low-rate for immature insects, light infestations or sparse vegetation.

**Cost:** \$6/L. Container size - 20 L.

**Water Volume:** Aerial application - use 12-40 L/ac (30-100 L/ha). Ground application - use sufficient water for good coverage.

6. SPRAYING TIPS: Apply when insects or damage first appears or, for alfalfa weevil, when 60-75% of alfalfa tips show feeding damage. Methoxychlor is the safest insecticide to use on alfalfa seed crops for alfalfa weevil control during the pollination period. Applications should be made in the late evening.
7. GRAZING RESTRICTIONS: Do not feed treated potatoes or potato refuse to livestock.
8. TOXICITY: Acute oral LD<sub>50</sub> = 6000 mg/kg (rat)
9. PRECAUTIONS, SYMPTOMS, FIRST AID: Wear protective gear to avoid contact with skin or eyes. Do not inhale vapours or spray mist. In case of contact - skin - wash thoroughly with soap and water - eyes - flush with water for 15 minutes. If swallowed - do not induce vomiting if the product contains petroleum distillate. Read the label for directions. Get medical attention.
10. STORAGE: If product is exposed to prolonged cold, place in warm storage at 10-20°C for several hours; agitate before using.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**MONITOR (methamidophos)**  
**Chemagro**

1. FORMULATIONS: Solution (480 g methamidophos/L)
2. REGISTERED MIXES: Compatible with most commonly used fungicides.
3. HOW IT WORKS: Methamidophos is a broad spectrum organophosphorus insecticide and acaricide which works by contact and systemic action. Non-phytotoxic when used as directed. Contact effectiveness may persist for 7-21 days.
4. NUMBER OF APPLICATIONS: Two per season on canola. Repeat as necessary on potatoes.
5. APPLICATION:

**With:** Ground or aircraft equipment.

<b>Rate:</b>	<b>Crop</b>	<b>Insect</b>	<b>L/ac</b>	<b>(L/ha)</b>
Canola (10)	Bertha armyworm		0.3-0.5	(0.7-1.3)
	Grasshoppers		0.5	(1.3)
Potato (14)	Aphids, Colorado potato beetle, potato flea beetle, potato leafhopper		0.7-0.9	(1.8-2.3)

Notes: 1. Pre-harvest interval (days) given in brackets after crop.  
2. Rate range - use the high rate for severe infestations, adult insects, or dense foliage.

**Cost:** \$16/L. Container size - 10 L.

**Water Volume:** Ground application - 80-400 L/ac (200-1000 L/ha).  
Aerial application on canola - use not less than 4 L/ac (10 L/ha).

6. APPLICATION TIPS: Apply when insects or damage first appears.  
Potatoes — apply at 10-14 day intervals or as necessary.
7. TOXICITY: Acute oral LD<sub>50</sub> = 30 mg/kg (rat)
8. PRECAUTIONS, SYMPTOMS OF POISONING, FIRST AID: Do not inhale vapours or spray mist. Wear a protective respirator suitable for protection against organophosphorous insecticides. Wear protective material, rubber gloves, protective clothing and goggles. Keep unprotected personnel out of mixing and spray area.

Symptoms of poisoning may include "tightness" in the chest, sweating, contracted pupils, stomach pains, vomiting and diarrhea. In case of poisoning get medical attention immediately. In case of contact - skin - wash with soap and water immediately - eyes - flush with water for 15 minutes. If swallowed - vomiting should be induced. Administer milk or water freely and induce vomiting by giving one dose (15 mL) of syrup of ipecac. Give a second dose if vomiting does not occur within 10-20 minutes. If syrup of ipecac is not available, induce vomiting by sticking a finger down the throat. Repeat until vomit fluid is clear. Patient should be lying down with head below the foot level and face down on to one side.

Do not apply under conditions involving possible drift to food, forage or other planting that might be damaged or the crops thereof rendered unfit for sale, use of consumption:

Keep out of lakes, streams and ponds. Fish will be killed if their waters are contaminated. Extremely toxic to wildlife. Highly toxic to bees exposed to direct treatment or residues on crops. Avoid using during pollination period.

9. STORAGE: This product is to be stored and displayed apart from food or feed. Do not store in or around the home. Store in a cool, dry place but not below -10°C. Protect from heat.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**SEVIN (carbaryl)**  
**Union Carbide**

1. FORMULATIONS: Liquid Suspensions - XLR, SL (480 g carbaryl/L).  
Wettable Powder - 50W (50% carbaryl).  
Sprayable Powder - 80S, (80% carbaryl).
2. REGISTERED MIXES: Most formulations are compatible with a wide range of pesticides. Liquid formulations are not compatible with diesel fuel, kerosene, fuel oil or aromatic solvents. All formulations are unstable when mixed with alkaline materials such as Bordeaux, lime-sulphur and casein-lime spreaders.
3. HOW IT WORKS: Carbaryl is a carbamate insecticide which works by contact and ingestion. Moderate to rapid in speed of action with short to moderate residual effectiveness (2 days to 4 weeks) depending on crop/pest complex, formulation and climatic conditions.
4. NUMBER OF APPLICATIONS: Repeat as necessary.
5. APPLICATION:

**With:** Ground or aircraft equipment.

<b>Rates:</b>	<b>Crop</b>	<b>Insect</b>	<b>Formulation</b>	<b>Qty/ac</b>	<b>(Qty/ha)</b>
	Canola+	Flea beetles, grasshoppers	XLR or SL 80S	500 mL 300 g	(1.3 L) (750 g)
	Cereals (14): barley, oats, rye, wheat	Grasshoppers	XLR or SL 50W 80S	0.5-1.0 L 450-900 g 300-600 g	(1.3-2.5 L) (1.1-2.3 kg) (0.8-1.5 kg)
	Forages (0): alfalfa, clover	Blister beetles, leafhoppers	XLR or SL 50W 80S	1.0-1.6 L 0.9-1.3 kg 600-700 g	(2.5-4.0 L) (2.3-3.3 kg) (1.5-1.8 kg)
		Alfalfa weevil larvae	50W 80S	1.3 kg 910 g	(3.3 kg) (2.3 kg)
		Alfalfa caterpillar, armyworm, webworms	XLR or SL 50W 80S	1.0-2.1 L 0.9-1.8 kg 700-900 g	(2.5-5.3 L) (2.3-4.5 kg) (1.8-2.3 kg)
		Cutworms (climbing species)	50W 80S	0.9-1.8 kg 0.6-1.2 kg	(2.3-4.5 kg) (1.5-3.0 kg)
		Sweet clover weevil	50W 80S	0.9-1.8 kg 600-900 g	(2.3-4.5 kg) (1.5-2.3 kg)
	Corn (1): field, sweet	Grasshoppers	XLR or SL	0.5-1.0 L	(1.3-2.5 L)
		Cutworms (climbing species)	XLR 80S 50W	2.1 L 1.2 kg 42.5 g/100 m row.	(5.3 L) (3.0 kg)
		European corn borer, corn earworm, fall armyworm	XLR or SL 50W 80S	1.0-1.6 L 0.9-1.3 kg 600-900 g	(2.5-4.0 L) (2.3-3.3 kg) (1.5-2.3 kg)
	Potato (7)	Cutworms (climbing)	XLR or SL 80S 50W	100-125 mL/300 m row 29 g/100 m row 42.5 g/100 m row	
		Colorado potato beetle	XLR or SL	500 mL	(1.3 L)
		Flea beetles, leafhoppers	XLR	500 mL	(1.3 L)
		Colorado potato beetle	50W	400 g	(1.0 kg)
		Potato flea beetles, leafhoppers	80S 50W	300-600 g 900 g	(0.7-1.5 kg) (2.2 kg)

Notes: 1. Pre-harvest or pre-grazing intervals (days) given in brackets after crop.  
 2. Rate ranges - use the low rate on immature insects, light infestations or sparse foliage; use the high rate for adult insects, severe infestations or dense foliage.  
 + Seedling application only to canola - up to four weeks after emergence.

**\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\***

**Cost:** XLR - \$7.50/L. Container size - 10 L. 80S - \$10/kg. Container size - 15 kg bag.

**Water Volume:** On all crops, use sufficient water to obtain thorough and uniform coverage (usually between 22-180 L/ac (55-440 L/ha) of spray depending on equipment, severity of infestation and stage of crop growth).

*Low volume aerial applications:* hot, dry conditions may cause excessive evaporation of droplets. A higher spray volume per hectare may be required under hot, dry conditions and when crop canopies are particularly dense. Dilutions greater than 1:11 (XLR:water) not recommended when wash off resistance is desired.

*Liquids:* Use at least 4.0 L/ac (10 L/ha) of prepared spray in aerial applications and at least 12 L/ac (30 L/ha) of prepared spray for low volume ground applications. For XLR use as low a water volume as possible.

*Wettable Powder:* Use at least 11-14 L/ac (28-35 L/ha) and at least 4-14 L/ac (11-35 L/ha) of prepared spray for aerial applications.

*Climbing cutworms:* on corn, use at least 90-120 L/ac (220-300 L/ha) with XLR or 80S, or 90-140 L/ac (220-350 L/ha) with 50W; on forages and cereals, use at least 225 L/ac (560 L/ha) with 50W or 80S.

**Nozzles:** Low volume applications: For wettable powder, use 50-mesh or coarser screens in entire system; nozzles should be cone type, No. 3 or larger. For XLR, use 50-mesh, in-line strainers and 25-mesh, slotted strainers behind the nozzle; nozzle should be of cone type sizes D6-45 or D8-45.

(Flat fan nozzles may be used [sizes 8008-8010] but care should be taken as excessive droplet breakup and resulting production of fine droplets may occur. Flat fan nozzles are also prone to plugging under hot, dry conditions).

6. **SPRAYING TIPS:** Timing and good coverage are essential for effective control. Apply when insects or damage first appears.

Prepare only as much spray mixture as is needed on the day of mixing. Do not store spray mixtures overnight. Calibrate spray equipment to deliver the required volume.

For all carbaryl formulations, agitate, stir or recirculate prior to use. Remove oil, rust, scale, pesticide residues and other foreign matter from mix tanks and entire spray system.

A dilution of 1:1 (XLR:water) will allow maximum resistance to rainfall or overhead irrigation. Avoid applying carbaryl just before rainfall. Spray droplets must dry on the foliage to have wash-off resistance. Under low humidity, at least one 1 h drying is adequate. Wash-off resistance cannot be expected when XLR is applied to wet foliage which does not dry before rainfall.

*Corn* - for larvae in whorls and for foliage feeders, treat entire plant. For climbing cutworms, spray in a 25-30 cm band over the row. For insects attacking silks and ears, apply, if necessary, at 2-4 day intervals; start when first silks appear and continue until silks begin to dry. Three or more applications may be required depending on the severity of the infestation.

*Grasshoppers* - on pasture, rangeland and associated borders, use XLR formulation at 500-900 mL/ac (1.2-2.3 L/ha) for nymphs or on sparse vegetation, or 0.9-1.4 L/ac (2.3-3.5 L/ha) for adults or dense vegetation.

*Alfalfa Weevil* - if pre-treatment damage is extensive, cut and make application to stubble.

7. **GRAZING RESTRICTIONS:** Remove cattle from area to be sprayed. Cattle may graze immediately after application. Treated forage and feed crops may be fed to dairy animals and animals for slaughter provided sprays are applied as directed.

8. **TOXICITY:** Acute oral LD<sub>50</sub> = 540 mg/kg (rat)

9. **PRECAUTIONS, SYMPTOMS OF POISONING, FIRST AID:** Wear protective gear to avoid contact with skin and eyes do not inhale spray mist. Carbaryl is toxic to bees and except for the XLR formulation should not be applied to crops in bloom. XLR can be applied when bees are not foraging provided the residue on the plants is dry before foraging commences.

Symptoms of poisoning may include salivation, tearing, urination, defecation, pinpoint pupils, muscle spasms, general muscular weakness, nausea, prostration, convulsions.

For skin and eye contact - flush with water. Contact a physician and go to a physician as quickly as possible. In case of emergency, phone collect (24 hours a day) 1-(514)645-5311.

10. **STORAGE:** Do not store where temperature frequently exceeds 38°C. All formulations will withstand freezing.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**SUPRACIDE (methidathion)**  
**Ciba - Geigy**

1. FORMULATIONS: Emulsifiable concentrate (250 g methidathion/L)
2. REGISTERED MIXES: None. Supracide is compatible with many fungicides.
3. HOW IT WORKS: A non-systemic organophosphate insecticide. Works by contact and ingestion.
4. APPLICATION:

**With:** Ground or aircraft equipment.

<b>Rate:</b>	<b>Crop</b>	<b>Insect</b>	<b>L/ac</b>	<b>(L/ha)</b>
Alfalfa (10)		Alfalfa weevil, leafhoppers, lygus bugs, pea aphid	0.4-0.9	(1.1-2.3)
		Flea beetles	0.3	(0.7)
Canola (30), mustard		Diamond-back moth, red turnip beetle	0.4	(1.0)
Potato (14)		Colorado potato beetle, flea beetles, leafhoppers, tarnished plant bug	0.4	(1.1)
Sunflower (50)		Painted lady butterfly, sunflower maggot, sunflower moth	0.8-1.1	(2.1-2.8)

Notes: 1. Pre-harvest interval (days) given in brackets after crop.  
 2. Rate range - use the high rate for severe infestation, adult insects, or dense foliage.

**Cost:** \$8.50/L. Container size - 10 L.

**Water Volume:** Ground equipment - 45 L/ac (110 L/ha); aircraft application - 9 L/ac (22 L/ha) or 4.5-9.0 L/ac (11-22 L/ha) for potatoes.

5. APPLICATION TIPS: Apply to alfalfa when insects or damage first appears or when 20-30% of stems have tip damage by alfalfa weevil. Repeat application as necessary or, for potatoes, at 7 day intervals (exception flea beetles and Colorado potato beetles at 10-15 day intervals). Thorough coverage of foliage is essential. Do not apply when rain is imminent.
6. GRAZING RESTRICTIONS: Do not harvest alfalfa for feed or hay or allow livestock to graze within 10 days of application. Do not feed or allow livestock to graze on treated canola, mustard or sunflower.
7. TOXICITY: Acute oral LD<sub>50</sub> = 65 mg/kg (rat).
8. PRECAUTIONS, SYMPTOMS OF POISONING, FIRST AID: Do not get in eyes, on skin or clothing. Wear goggles or face shield and rubber gloves when mixing. Do not inhale spray mist. Wear a respirator during prolonged use. Do not re-enter the treated field on day of application. Toxic to bees, do not apply to crops in bloom. A minimum 3 day re-entry period for foraging bees is necessary.

*Symptoms of poisoning:* Typical organophosphate poisoning symptoms may include: headache, dizziness, blurred vision, weakness, nausea, cramps, diarrhea, discomfort in chest, sweating, salivation, pulmonary edema, cyanosis, uncontrollable muscle twitches, loss of reflexes, convulsions, coma.

In case of contact - skin - wash with soap and water - eyes - flush with water for at least 15 minutes and get medical attention. If swallowed - induce vomiting and get immediate medical attention.

9. STORAGE: Store at temperatures above 0°C. Do not use or store near heat or open flame.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**TEMIK (aldicarb)**  
**Union Carbide**

1. FORMULATIONS: Granular - Temik 10G (10% aldicarb)
2. REGISTERED MIXES: Compatible with most fertilizers and pesticides. Do not use with alkaline materials such as lime.
3. HOW IT WORKS: Aldicarb is a soil-applied, systemic, carbamate insecticide. Soil moisture is required to release the active chemical from the granules (corn cob grits) so irrigation or rainfall should follow application. Uptake by roots is rapid; residual activity varies with dosage and pests involved but often lasts more than 6 weeks.
4. NUMBER OF APPLICATIONS: One application per year for field crops.
5. APPLICATION:

**With:** Ground equipment.

<b>Rate:</b>	<b>Crop</b>	<b>Insect</b>	<b>kg/ac</b>	<b>(kg/ha)</b>
	Potato	Flea beetles, Colorado potato beetle, leafhoppers	9 or 200 g/100 m row	(22.5)
		Aphids	4.5 or 100 g/100 m row	(11)
	Sugar beet	Sugar beet root maggot	4.5 or 100 g/100 m row	(11)

**Cost:** \$5.75/kg. Container size - 15 kg.

**Incorporation:** Furrow Treatment - Apply granules with seed in the planting furrow and cover with soil. Band Treatment - At planting, apply granules in a 20 cm wide band and work into the soil or cover with soil to a depth of 10 cm. Plant seed pieces in the treated zone. Side Dressing - At post-emergence, drill granules at a depth of 8-20 cm (usually 2.5-5 cm below the seed pieces) on both sides of the row, 5-10 cm from the row.

6. APPLICATION TIPS: Do not apply to very dry soil unless treatment is followed by irrigation. Calibrate and adjust application equipment to insure proper rate and accurate placement.
7. RESTRICTIONS: Do not harvest potatoes or sugar beets within 90 days of application. Do not harvest sugar beet tops for livestock feed within 120 days of application. Do not use tops from treated beets as food for humans. Do not use plant parts for food or feed. Do not plant food crops in soil treated with this product for at least 1 year after treatment.
8. TOXICITY: Acute oral LD<sub>50</sub> = 0.6 mg/kg (rat)

9. PRECAUTIONS, SYMPTOMS OF POISONING, FIRST AID: Wear protective, long-sleeved clothing, goggles, pesticide respirator, and rubber gloves when handling. After work, wash entire body with soap and water. Wash contaminated clothing and protective equipment in a strong solution of washing soda and rinse thoroughly before wearing again. Avoid any contact with the product. Deep disc spills at row ends immediately to prevent birds from feeding on exposed granules. Do not mix granules directly with water. Do not use applicators that would grind granules. Do not apply to crops in open bloom.

Symptoms of poisoning may include weakness, headache, sweating, nausea, vomiting, diarrhea, tightness in chest, blurred vision, pinpoint pupils, abnormal flow of saliva, abdominal cramps, unconsciousness.

Contact a physician immediately in all cases of suspected poisoning. In case of contact - skin - wash immediately with soap and water - eyes - flush with water for 15 minutes. If swallowed - cause vomiting immediately by putting a finger down the throat. Give water, repeat until vomit fluid is clear. Start artificial respiration if victim stops breathing. Get to a physician or hospital immediately. In case of emergency, telephone collect 24 hours a day 1-(514)-645-5311.

10. STORAGE: Do not refrigerate.
11. DECONTAMINATION AND DISPOSAL: Dispose of empty containers by delivering them to an approved landfill site for burial.

If spill occurs on floor areas, use a sweeping compound to clean up. Decontaminate the waste with a solution of caustic soda, a strong commercial bleach and detergent. Wash floor with the decontamination solution and rinse well with clean water. Clean up the solution and rinse water with absorbent material such as sawdust, sweeping compound or rags. Dispose of waste and rinsings by burying in a non-crop, non-graze area away from all water supplies.

If spill occurs on the ground, collect the material and dispose of it as above. Treat the affected area with the decontamination solution and cover with clean soil.

Decontamination Solution - Into 10 L of water, slowly and carefully add in sequence 130 g detergent, followed by 525 g caustic soda (lye) and finally 1.2 L of commercial bleach (sodium hypochlorite). Handle and use the solution with great care. Do NOT add water to dry lye.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**THIODAN (endosulfan)**  
**Hoechst**

1. FORMULATIONS: Emulsifiable concentrate (400 g endosulfan/L)      Wettable powder (50% endosulfan by weight)
2. REGISTERED MIXES: Endosulfan is compatible with most insecticides and fungicides except Bordeaux mixture, hydrated lime, calcium arsenate or Zinc sulfate.
3. HOW IT WORKS: Endosulfan is a non-systemic, organochloride insecticide/acaricide with both contact and stomach action.
4. NUMBER OF APPLICATIONS: Repeat as necessary except for corn (sweet and field - not more than twice per season) and sugar beet (not more than once).
5. APPLICATION:

**With:** Ground or aircraft equipment.

<b>Rates:</b>	<b>Crop</b>	<b>Insect</b>	<b>Formulation</b>	<b>Qty/ac</b>	<b>(Qty/ha)</b>
	Alfalfa (30) clover (30)	Spittle bugs	EC	0.3 L	(0.8 L)
	Alfalfa seed	Aphids	EC	0.6 L	(1.5 L)
		Lygus bugs		1.8-2.2 L	(4.5-5.5 L)
	Corn (50)	Corn leaf aphid	EC or WP	1.1 L 0.9 kg	(2.8 L) (2.3 kg)
	Corn (50)	Corn earworm	EC or WP	1.1-1.7 L 0.9-1.3 kg	(2.8-4.3 L) (2.3-3.3 kg)
	Potato (0)	Aphids, Colorado potato beetle, flea beetles, leafhoppers, tuber flea beetles	EC or WP	0.6 L 0.4 kg	(1.5 L) (1.1 kg)
	Sugar beets (45)	Green peach aphid	EC	0.6 L	(1.5 L)
		Beet webworm	EC	1.1 L	(2.8 L)

Notes: 1. Pre-harvest or pre-grazing intervals (days) given in brackets after crop.  
 2. Rate range - use the lower rate for young insects (larvae), light infestations or sparse foliage.

**Cost:** EC - \$8.25/L. Container size - 20 L, 4 L. WP - \$15.30/kg. Container size - 2 kg.

**Water Volume:** Thorough wetting of all plant parts is essential for good results.

6. SPRAYING TIPS: Mixing WP - fill spray tank nearly full and either pour recommended amount on water surface or pre-mix powder in a bucket half-filled with water then pour mix through screen into nearly filled spray tank. Finish filling tank. Keep agitator running during filling and spraying. Spray upper and lower leaf surfaces.
7. GRAZING RESTRICTIONS: Do not feed treated crop refuse (vines, tops, stocks or threshings) or sugar beet foliage to livestock. Sugar beet roots may be fed. Do not ensile treated corn. Do not graze treated green crops except for alfalfa and clover which should not be foraged within 30 days of application. Succeeding crops - Do not apply to crops which are to be followed by a root crop other than carrots, potatoes, sweet potatoes or sugar beets.
8. TOXICITY: Acute oral LD<sub>50</sub> = 80-110 mg/kg (rat)
9. PRECAUTIONS, SYMPTOMS OF POISONING; FIRST AID: Wear goggles, respirator, coveralls, and synthetic rubber gloves when mixing or loading or when spray mist cannot be avoided. Toxic to bees, apply during late evening. Change clothing daily and wash before reuse. Symptoms of poisoning may include nausea, headache, general feeling of being unwell, followed by generalized convulsion. In case of contact - skin - wash thoroughly with soap and water - eyes - flush with plenty of water for 15 minutes and go to nearest hospital immediately. If the wettable powder is swallowed, induce vomiting after giving two glasses of water by inserting finger in throat, repeat until vomit is clear. If emulsifiable concentrate is swallowed, do not induce vomiting and avoid breathing vomitus into the lungs should vomiting occur. Get immediate medical attention.
10. STORAGE: Do not store E.C. below -7°C.
11. DECONTAMINATION AND DISPOSAL: For spilled powder, spread with sawdust or dirt to prevent scattering. Apply sodium carbonate, caustic soda or hydrated lime on contaminated area. After one hour collect with a shovel or a broom and wash paved areas with water. For spilled liquid, decontaminate with any of above alkaline chemicals and allow to stand for one hour. Apply sawdust, talc, or sand to absorb all liquid. Decontaminate tools with hydrated lime. Bury unusable or clean-up product 50 cm deep in an isolated area away from any water supply. Powder removed from the site without decontamination must be decontaminated while being buried by alternating layers of caustic soda or lime with endosulfan powder. When burying with clean-up absorbents from liquid spills, apply a layer of soda, caustic or lime on the top before filling the hole.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*



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## CHEMICAL CONTROL OF PLANT DISEASES IN ALBERTA

### Introduction

Plants, like other living organisms, are attacked by many diseases that are caused by fungi, bacteria, viruses, mycoplasmas and nematodes. The management of plant diseases is based on four general parameters that include:

- a) **Exclusion** or quarantine, i.e. prevention of a disease organism or diseased plant material from entering a country or disease-free area where the disease could become established;
- b) **Protection** whereby proper sanitation practices, chemical controls, adequate soil nutrient levels and good soil drainage may be used to protect plants from disease organisms;
- c) **Eradication** involving the use of crop rotations or the application of eradicate chemicals such as fungicides; and
- d) **Plant breeding** whereby crop plants are selected for partial or complete resistance to a specific disease or range of infectious diseases.

In Alberta, fungal diseases of field crops may be subject to direct chemical control by fungicides whereas control of other diseases rely on alternate methods. The major use of fungicides in these crops at present is in the treatment of seeds (cereal, forage, oilseed) and potato seed pieces. Except for canola and field beans, foliar fungicides are not generally registered, available or economically feasible at the present time. For convenience, dual purpose treatments with the insecticide Lindane, used in seed-treatment formulations, have been included in this chapter on fungicides.

The principles and procedures involving the use of plant disease control chemicals follow the guidelines outlined for chemical weed control in the first chapter of this manual.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**BENLATE (benomyl)**  
Dupont Canada Inc.

1. FORMULATIONS: 50% Wettable Powder
2. REGISTERED MIXES: With fungicides, captan and thiram. Dual purpose formulations with insecticide, lindane. Do not mix with alkaline pesticides such as basic copper sulphate, Bordeaux mixture or lime sulphur.
3. HOW IT WORKS: Benomyl is a protective systemic fungicide.
4. NUMBER OF APPLICATIONS: One per season.
5. HOW TO APPLY:

With: Ground or aircraft equipment.

Crop	Disease	Rate g/ac	Rate (kg/ha)
Beans, (dry, white, snap, common) (14)	Sclerotinia (white mould), botrytis (gray mould)	710-910	(1.75-2.25)
Canola	Sclerotinia (stem rot)	400-600	(1.0-1.5)

Notes: 1. Pre-harvest interval (days) given in brackets after crop.  
2. Rate range - use the high rate under severe disease conditions.

Cost: \$40-44/kg

Water Volume: Beans - 1000 L water/500 g product.

Canola - minimum 16 L water/ac (40 L/ha).

6. SPRAYING TIPS: Beans - apply between 50 and 100% bloom; thorough coverage. Under high humidity conditions when crop canopy favors high yields, split application may be necessary. Canola - apply between 20 and 30% bloom; thorough coverage.

Continuous agitation is required to keep the material in suspension. Do not apply when rain is imminent; do not irrigate within six hours of application.

7. GRAZING RESTRICTIONS: Do not graze or feed treated bean hay to livestock.

8. TOXICITY: Acute oral LD<sub>50</sub> (in mg/kg for rats): benomyl (710,000).

9. SAFETY, PRECAUTIONS, STORAGE AND DISPOSAL: Symptoms of poisoning: product may irritate eyes, nose, throat and skin.

First aid: IF ON SKIN or IF IN EYES - flush with plenty of water. Get medical attention for the eyes.

Keep out of reach of children. Avoid breathing dust or spray mist. Avoid contact with skin, eyes and clothing. Keep away from fire or sparks.

Product is toxic to fish. Do not contaminate lakes, streams or ponds. Do not apply when weather conditions favor drift from treated areas. Do not contaminate water by cleaning of equipment or disposal of wastes.

Never allow product to become wet during storage reduced fungicidal effectiveness may result. Keep container closed when not in use. Do not reuse container; burn when empty.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**DUAL PURPOSE FORMULATIONS**  
**BENOMYL : CAPTAN : LINDANE**  
Chipman Inc.

1. FORMULATIONS: Dust - Gammasan + (6% : 10% : 50%)
2. HOW IT WORKS: Benomyl systemic fungicide protects against blackleg. Captan fungicide protects young plants against rots and damping-off. Lindane organochlorine insecticide which acts by ingestion, contact and, to a lesser extent, by fumigant action against many soil-dwelling insects.
3. HOW TO APPLY: Pre-seeding treatment - preferred method of application. Treat seed in an end-over-end drum-type seed treater or a cement mixer.

Drill box Treatment (follow directions carefully - misapplication may result in drill plugging). When starting with an empty planter box, treat enough seed in a separate container to cover bottom of planter box. Mix powder and seed thoroughly until seed is a uniform white by either of the following methods.

- (i) Place and level one-half of the seed in drill or planter box and sprinkle uniformly over surface, one-half the powder required for the full planter box. Mix thoroughly with a paddle, then fill the box with seed and sprinkle the remaining one-half of the powder over the seed and mix again until seed is a uniform white. Do not mix with bare hands.

OR

- (ii) Dribble 775 g of powder into each 25 kg of seed as it is poured into the drill box. Thoroughly mix with a lath or paddle when the drill box is one-half full and again when full until seed is a uniform white.

**Crop      Disease and Insect      Rate**

Canola      Blackleg, seedling blight, flea beetles      750-1550 g/25 kg seed

Notes      - Use the high rate in areas of heavy flea beetle infestation (generally only produced by successive cropping of flea beetle-susceptible crops on the same or immediately adjacent areas).  
- Provides flea beetle protection during germination and early emergence only.  
- For high rate, use 150 mL mineral oil or linseed oil as a sticker per 25 kg seed. Churn or mix the seed and oil then add powder and mix again. High rate should be used only with planting equipment that can be adjusted to compensate for the increased coating on the seed.

Cost:      \$20-22/kg

4. TOXICITY: Acute oral LD<sub>50</sub> (in mg/kg for rats): benomyl (710,000), captan (9,000), lindane (88-125).

5. SAFETY PRECAUTIONS, STORAGE AND DISPOSAL: Symptoms of poisoning: Lindane - nausea, vomiting, hyperirritability, convulsions, coma. Skin contact with fungicides may result in irritation and dermatitis.

First aid: IF SWALLOWED - cause vomiting by sticking finger down throat or swallowing syrup of ipecac, then give a laxative such as epsom salts. Get medical attention. Avoid liquid petrolatum and castor oil. IF IN EYES - flush with plenty of water. IF ON SKIN - wash with soap and water.

KEEP OUT OF REACH OF CHILDREN. Poisonous if swallowed, inhaled or absorbed through the skin. Wash thoroughly after handling or using and before eating or smoking. Wash contaminated clothing before re-use. Do not contaminate bodies of water, food or feed. Bury empty containers. Lindane is toxic to fish, birds and animals.

Do not store in the home or near food or feed. Never allow product to become wet during storage (this may lead to chemical changes which will reduce the effectiveness of the benomyl fungicide). Keep container closed when not in use. Dry treated seed may be stored for several months. Oil-dressed seed should be sown within one week of treating to avoid shedding of treatment.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**DUAL PURPOSE FORMULATIONS**  
**BENOMYL : THIRAM : LINDANE**  
Federated Co-operatives Ltd.

1. FORMULATIONS: Dusts - Benolin R (6% : 10% : 50%)  
- Thiralin Plus (6% : 10% : 75%)
2. HOW IT WORKS: Benomyl a systemic fungicide that protects against blackleg. Thiram fungicide protects against seed-borne diseases. Lindane, an organochlorine insecticide that acts by ingestion, contact and, to a lesser extent, by fumigant action against many soil-dwelling insects.
3. HOW TO APPLY: Seed to be treated with Benolin R may be treated first with canola or vegetable oil (135 mL/100 kg seed) to improve contact between seed and product. Thiralin Plus has an added adhesive. Half fill the drill or planter box and sprinkle the required amount of powder over the seed. Mix with a paddle until the seed is a uniform white. Add enough seed to fill the box, cover with the required amount of powder and mix again. For large boxes, it may be necessary to divide the seed into several portions. As an alternate method, use a commercial drum or auger, dust seed-treater or a cement mixer. Clean planter plates periodically to prevent excessive build-up of chemicals. Do NOT mix with bare hands. Under certain circumstances, for example, if excessive oil is added, the seed may bridge in the seed drill. Check the seed drill calibration before and during seeding operation.

Crop	Disease and Insect	Rate
Canola	Blackleg, damping-off, seedling decay, seedling blight, flea beetles	750 g/25 kg seed
Cost:	Benolin R \$20-22/kg, Thiralin plus \$	

4. GRAZING AND CROPPING RESTRICTIONS: Do not use on soil in which edible root crops (except rutabagas and turnips) are to be planted in the same or following season.
5. TOXICITY: Acute oral LD<sub>50</sub> (in mg/kg for rats): benomyl (710,000), thiram (375), lindane (88-125), Thiralin-Plus (40-200).
6. SAFETY PRECAUTIONS, STORAGE AND DISPOSAL: Symptoms of poisoning: Lindane - nausea, vomiting, hyper-irritability, convulsions, coma. Skin contact with fungicides may result in irritation and dermatitis. Consumption of alcohol 24 hours before or after working with **thiram** may cause sweating, flushing, headache and nausea.

First aid: IF SWALLOWED - cause vomiting by sticking finger down throat or swallowing syrup of ipecac, then give a laxative such as epsom salts. Get medical attention. Avoid liquid petrolatum and castor oil. IF IN EYES - flush with plenty of water. IF ON SKIN - wash with soap and water.

KEEP OUT OF REACH OF CHILDREN. Poisonous if swallowed, inhaled or absorbed through the skin. Wash thoroughly after handling or using and before eating or smoking. Wash contaminated clothing before re-use. Do not contaminate bodies of water, food or feed. Bury empty containers. Lindane is toxic to fish, birds and animals.

Do not store in the home or near food or feed. Never allow product to become wet during storage (this may lead to chemical changes which will reduce effectiveness of the benomyl fungicide). Keep container closed when not in use. Dry, treated seed may be stored for several months. Oil-dressed seed should be sown within one week of treating to avoid shedding of treatment.

**CARBATHIIN**  
Uniroyal Chemical Ltd.

1. FORMULATIONS: Vitavax Seed Treatment  
Solutions — 23.3% carbathiin — 18.4% carbathiin
2. REGISTERED MIXES: With fungicides —  
Vitavax powder (carbathiin 26.7 : thiram 38.8)  
Vitaflor-280 (carbathiin 14.9 : thiram 13.2)  
Pro-gro (carbathiin 30 : thiram 50)  
Vitavax-captan 30W (carbathiin 6 : captan 24).  
  
Dual purpose formulations (with insecticide) —  
Vitavax rs flowable (carbathiin 3.3 : thiram 6.6 : lindane 49.9)  
Vitavax rs powder (carbathiin 3.3 : thiram 6.7 : lindane 50.0)  
Vitavax dual powder (carbathiin 20.0 : thiram 28.9 : lindane 18.7)  
Vitavax dual solution (carbathiin 16.9 : lindane 15.7)
3. HOW IT WORKS: Carbathiin a systemic fungicide, penetrates the seed coat to control disease.
4. NUMBER OF APPLICATIONS: One, applied up to 8 months prior to seeding.
5. HOW TO APPLY:  
  
With: On-farm treatment - through the auger with special equipment or with an inexpensive pump or driplator device; or at seed cleaning plant.  
  

<b>Crop</b>	<b>Disease</b>	<b>Rate mL/25 kg seed</b>
Barley	Smuts (covered, false loose, true)	60 (23.3% solution) or 75 (18.4% solution)
Flax	Damping-off, seed decay	100 (23.3% solution)
Oats	Smuts (loose, covered)	80 (23.3% solution) or 104 (18.4% solution)
Rye	Stem smut	50 (23.3% solution)
Wheat	Smuts (true loose, stinking) stinking)	60 (23.3% solution), or 73 (18.4% solution)
Cost:	\$10-12/L	
6. GRAZING RESTRICTIONS: Treated seed should not be used as feed. Do not graze or feed livestock on treated areas for 4 weeks after planting.
7. TOXICITY: Acute oral LD<sub>50</sub> (in mg/kg for rats): carbathiin (7056).
8. SAFETY PRECAUTIONS, STORAGE AND DISPOSAL: First aid: IF SWALLOWED - induce vomiting by giving 15 mL salt, mustard or soap in a glass of warm water. Repeat until vomit fluid is clear. Keep patient quiet. Obtain medical attention. IF IN EYES - flush immediately with running water for 15 minutes. IF ON SKIN - wash with warm water and pumice soap.  
  
KEEP OUT OF REACH OF CHILDREN. Do not get in eyes or on skin. Work in well ventilated area. When treating seed, augering or handling treated seed, wear a dust mask, goggles and gloves. Avoid breathing vapours.  
  
Treated seed is easily recognized by its prominent red colour. Do not contaminate lakes, ponds or streams.  
  
Store above 0°C. Do not store in or around the home.  
  
Puncture and crush empty container, bury 50 cm deep away from any source of water, or take to designated disposal area.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**CARBATHIIN : THIRAM**  
Uniroyal Chemical Ltd.

1. FORMULATIONS: Dust - Vitavax Powder  
(carbathiin 26.7% : thiram 38.8%).
2. REGISTERED MIXES: With the insecticide - lindane (% carbathiin : % thiram : % lindane)  
  
Vitavax Dual Powder (20.0 : 28.9 : 18.7)  
Vitavax rs Flowable (3.3 : 6.6 : 49.9)  
Vitavax rs Powder (3.3 : 6.7 : 50.0).
3. HOW IT WORKS: Thiram is a fungicide which controls diseases carried on the seed. Carbathiin is a systemic fungicide which penetrates the seed coat to control diseases inside the seed and seedling.
4. NUMBER OF APPLICATIONS: One, at the time of planting.
5. HOW TO APPLY: Dust - Do not mix with bare hands.

Fill the drill or planter box to one-half capacity and sprinkle one-half the required amount of powder over the seed. Mix thoroughly with a paddle until the seed is uniformly covered. Seed should all be pink. Then add enough seed to fill the box, cover with the remaining powder and repeat mixing procedure. For large drill or planter boxes, it may be necessary to divide the seed into several portions. Clean planter plates periodically to prevent excessive build-up of treatment chemicals.

<b>Crop</b>	<b>Disease</b>	<b>Rate g powder/25 kg seed</b>
Barley	Smuts (false loose, true loose, covered)	50 powder
Flax	Damping-off, seed decay	60 powder
Oats	Smuts (loose, covered)	70 powder
Rye	Damping-off, seed decay, stem smut	45 powder
Wheat	Smuts (loose, stinking), bunt	55 powder
Cost:	\$18/kg	

6. GRAZING RESTRICTIONS: Do not use treated seed for feed, food or oil processing. Do not graze or feed livestock on treated areas for 4 weeks after planting.
7. TOXICITY: Acute oral LD<sub>50</sub> (in mg/kg for rats) = carbathiin : thiram (1600).
8. SAFETY PRECAUTIONS, STORAGE AND DISPOSAL: Symptoms of poisoning: Skin contact may result in irritation and dermatitis. Consumption of alcohol within 24 hours of working with thiram may cause flushing, sweating, headache and nausea.

First aid: IF SWALLOWED - induce vomiting by giving syrup of ipecac (adult dosage 30 mL; children under 12 years 15 mL) followed by water to enhance vomiting. Keep patient quiet. Seek medical attention immediately. IF ON SKIN - wash with warm water and pumice soap to remove dye. IF IN EYES - flush immediately with running water. Seek medical attention.

KEEP OUT OF REACH OF CHILDREN. Work in a well ventilated area and wear a dust mask, goggles and gloves. Do not contaminate food or feed. Do not contaminate any water supply.

Do not store product in or around the home or near food or feed. Store powder in a dry area. Do not store suspension in direct sunlight or at temperatures above 35°C.

Do not store seed treated with powder.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**DUAL PURPOSE FORMULATIONS**  
**CARBATHIIN : THIRAM : LINDANE**  
Uniroyal Chemical Ltd.

**1. FORMULATIONS: (carbathiin : thiram : lindane)**

Suspension - Vitavax RS Flowable (3.3% : 6.6% : 49.9%)  
Dusts - (1) Vitavax RS Powder (3.3% : 6.7% : 50.0%)  
- (2) Vitavax Dual Powder (20.0% : 28.9% : 18.7%)  
Solution - Vitavax Dual Solution (carbathiin 16.9% : lindane 15.7%).

**2. HOW IT WORKS:** Lindane an organochlorine insecticide which acts by ingestion, contact and, to a lesser extent, by fumigant action against many soil-dwelling and phytophagous insects. Thiram a fungicide which controls seed-borne diseases. Carbathiin a systemic fungicide which penetrates the seed coat to control diseases of the seed and seedling.

**3. NUMBER OF APPLICATIONS:** One, at the time of planting.

**4. HOW TO APPLY:**

With: Seed-dressing equipment.

<b>Crop</b>	<b>Disease and Insect</b>	<b>g powder or mL</b>	<b>Rate Solution/25 kg seed</b>
Barley	Smuts (covered, false loose, true loose), wireworms	70 (powder (2))	75 (solution)
Canola	Damping-off, seed decay, blackleg, flea beetles	750(powder (1))	562 (suspension)
Flax, Mustard,	Damping-off, seed decay Seed decay, blackleg, flea beetles	70 (powder (2)) 750 (powder (1))	
Oats	Smuts (covered, loose); wireworms	95 (powder (2))	105 (solution)
Rye	Stem smut, damping-off, seed decay, wireworms	60 (powder (2))	
Wheat	Smuts (loose, stinking), bunt, wireworms	65 (powder (2))	75 (solution)

**Cost:** Vitavax rs. Flowable \$37-39/L, Vitavax Dual Powder \$, Vitavax Dual Solution \$20-21/L

Flowable can be applied either in a continuous treating operation with S-Series Treaters or OFT Treaters (available from Uniroyal Chemical) or with batch treaters or cement mixers.

Fill drill box to one-half capacity and sprinkle required amount of powder over seed. Mix with a paddle until seed is an uniform white. Add seed to fill the box, cover with remaining powder and repeat. For large drill boxes, divide the seed into several portions. Clean planter plates periodically to prevent excessive build-up of chemicals.

Solution can be applied on the farm using an auger with a pump or driplator device or custom application is available at seed cleaning plants.

**5. GRAZING RESTRICTIONS:** Do not use treated seed for feed, food or oil processing. Do not graze or feed livestock on treated areas for 4 weeks after planting.

**6. TOXICITY:** Acute oral LD<sub>50</sub> (in mg/kg for rats): Vitavax rs (421), Vitavax Dual Solution (1740), carbathiin (3820), thiram (375), lindane (88-125).

**7. SAFETY, PRECAUTIONS, STORAGE AND DISPOSAL:** Symptoms of poisoning: With lindane - nausea, vomiting, hyper-irritability, convulsions, coma. Skin contact with fungicides may result in irritation and dermatitis. Consumption of alcohol 24 hours before or after working with thiram may cause sweating, flushing, headache and nausea.

**First aid:** IF SWALLOWED - induce vomiting by giving syrup of ipecac (adult doses 30 mL; children under 12 years 15 mL) followed by water to enhance vomiting. Keep patient quiet. Seek medical attention immediately. IF ON SKIN - wash with warm water and soap. IF IN EYES - flush immediately with running water. Seek medical attention.

**KEEP OUT OF REACH OF CHILDREN.** Work in a well ventilated area and wear a dust mask, goggles and gloves. Do not contaminate food or feed. Do not contaminate any water supply.

Do not store in or around the home and store above 0°C. Seed treated with flowable may be stored for up to 3 months. Do not store in areas where temperatures exceed 25°C. Store powder in dry area. Do not store seed treated with powder. Leftover seed treated with powder should be double sown around the headland, or buried away from water sources.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

## **FORMALDEHYDE (formalin)**

Later's Chemicals Ltd.

1. FORMULATION: Solution - 37% formaldehyde (formalin)
2. HOW IT WORKS: Formaldehyde is a bactericide and fungicide, used as a soil fumigant and seed treatment, although the latter use is limited by phytotoxicity. (1 mL solution = 1.08 g)
3. NUMBER OF APPLICATIONS: One.
4. HOW TO APPLY:

With: Small sprayers or sprinklers.

<b>Crop</b>	<b>Disease</b>	<b>Rate</b>
		<b>g Solution 25 kg grain</b>
Barley	Covered smut	40 (37 mL)
Oats	Smuts: covered, loose	40 (37 mL)
Wheat	Bunt and covered smut	40 (37 mL)
Potato tubers	Common scab, black scurf, rhizoctonia	50 mL solution (cold) or 100 mL solution (hot)

Water Volume: Potato tubers - cold treatment - use 50 mL/10 L water to soak uncut tubers for 2 hours; hot treatment - use 100 mL/10 L 49-52°C water to soak uncut tubers for 3-4 minutes, then cover for one hour. Allow tubers to dry before cutting and planting.

Grain - use 325 g solution/100 L water.

Cost: \$1.90-\$2.80/L

Application tips: Grain - pile grain on a clean floor, sprinkle well with solution and shovel over until all grains are thoroughly wet. Cover for 4 hours (or overnight) with clean sacks or blankets moistened with solution. Sow as soon as possible, preferably while still damp. If smut balls are present, immerse grain in the solution for 5 minutes. Stir. Skim off smut balls. Drain thoroughly and cover as above.

5. TOXICITY: Acute oral LD<sub>50</sub> (in mg/kg for rats) = formaldehyde (800).

6. SAFETY PRECAUTIONS, STORAGE AND DISPOSAL: Skin contact may produce irritation and dermatitis. Ingestion may cause severe abdominal pain, nausea, and vomiting, sometimes followed by stupor. Exposure to vapours may cause burning and stinging of eyes and headache.

IF SWALLOWED - induce vomiting by touching back of the throat with a finger or blunt object; repeat until vomit fluid is clear. Then give a gruel of flour and water. Do not induce vomiting or give anything by mouth to an unconscious person. Rush patient to nearest hospital taking the labelled container with you. IF ON SKIN - remove contaminated clothing and wash skin with soap and water. IF IN EYES - flush with plenty of water for 15 minutes and get medical attention.

IF INHALED - remove patient to fresh air; have him lie down and keep quiet and warm. Give patient egg white and milk; obtain medical attention.

A gas mask should be worn to prevent inhaling the gas fumes, and gloves to prevent skin irritation. Leave the room or building as soon as possible. Avoid prolonged or repeated contact and breathing of vapor. May cause irritation of skin, eyes, nose, and throat. Use with good ventilation. Keep away from heat, fire and sparks. Do not contaminate food, feed, or any body of water.

Do not freeze. Minimum storage temperature 15°C. Store in a dry, ventilated place, away from food and feed. Puncture empty container and bury at least 50 cm deep and away from water supply.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

## DUAL PURPOSE FORMULATIONS

### MANEB : LINDANE

Federated Co-operatives Ltd.

1. FORMULATIONS: Dusts - Co-op DP, Mergamma N-M, Pool N-M Dual and Trinox (37.5% : 18.75%)
2. HOW IT WORKS: Maneb is a protective, seed-treatment fungicide. Lindane is an organochlorine insecticide that works by ingestion, contact and, to a lesser extent, by fumigant action against many soil-dwelling insects.
3. HOW TO APPLY: Place and level one-half of seed in drill box and sprinkle one-half of required amount of product uniformly over seed. Mix thoroughly with a paddle. Fill box with seed and sprinkle on remaining powder, mix again until all streaking has disappeared and colouring of seed is uniform.

#### Alternate Methods:

- i) Dribble the required amount of product into the seed as it is poured into the drill box. Thoroughly mix with a paddle when drill box is one-half full and again when full until colouring of seed is uniform.
- ii) Apply through a mechanical dispenser or proportioner that attaches to the auger that conveys seed into the drill box.
- iii) Apply with any standard dry seed-treatment application equipment.

Crop	Disease and Insect	Rate g/25 kg seed
Barley	Smuts (covered, false loose), seedling blight, root rot, wireworms	65 (powder)
Oats	Smuts, seedling blight, root rot, wireworms	92 (powder)
Rye	Bunt, seedling blight, root rot, wireworms	56 (powder)
Wheat	Bunt, stinking smut, seedling blight, root rot, wireworms	52 (powder)
Cost:	\$9.50/kg	

4. TOXICITY: Acute oral LD<sub>50</sub> (in mg/kg for rats): maneb (6750), lindane (88-91)

5. SAFETY PRECAUTIONS, STORAGE AND DISPOSAL: Symptoms of poisoning: Lindane - may include nausea, vomiting, hyper-irritability, convulsions, coma, and other symptoms typical of organochlorine insecticide poisoning. Skin contact with maneb may produce irritation or dermatitis.

Toxicological information (for the physician): Lindane is an organochlorine insecticide. Barbiturates may be given to control convulsions. Oxygen may be indicated. Keep patient quiet. Avoid use of morphine and adrenaline.

IF SWALLOWED - cause vomiting by sticking finger down throat or swallowing syrup of ipecac, then give a laxative such as epsom salts. Avoid liquid petrolatum and castor oil. Get medical attention. IF IN EYES - flush with plenty of water. IF ON SKIN - wash with soap and water.

Do not contaminate food, feed or any water supply. Treat only the amount of seed required to avoid having to store treated seed.

Do not store in or around the home. Do not store near food or feed. Never allow product to become wet during storage. This may lead to chemical changes which will reduce the effectiveness of fungicide. Keep container closed when not in use. Do not store treated seed more than one year.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**MANZATE-D, DITHANE M-22 (maneb)**  
Federated Co-operatives Ltd.

1. FORMULATIONS: Drill Box Seed Treatments - Agrox N-M Wettable Powder, Co-op N-M Dust, Pool N-M Dust (50% maneb). Foliar Spray - Maneb 80-W Wettable Powder (80% maneb).
2. REGISTERED MIXES: With lindane as dual purpose formulations.  
Compatible with most insecticides and fungicides but not with Bordeaux or lime.
3. HOW IT WORKS: Maneb is a fungicide, effective against many seedling and foliar diseases.
4. NUMBER OF APPLICATIONS: One for seed treatment. Repeat every 7-10 days for treatment of early and late blight on potatoes; shorten interval to 5-7 days when weather favours disease.
5. APPLICATION WITH: Protective Equipment: Wear a dust mask, goggles, long-sleeved shirt, rubber or PVC gloves and rubber or PVC apron when handling product. Ventilate indoor working area.

Place and level one-half of the seed in drill box and sprinkle one-half of the required amount of product uniformly over seed. Mix thoroughly with a paddle. Fill box with seed and sprinkle remaining powder and mix again until all streaking has disappeared and colouring of seed is uniform.

OR

Dribble the required amount of product into seed as it is poured into drill box. Thoroughly mix with a paddle when drill box is one-half full and again when full until colouring of seed is uniform.

OR

Apply through a mechanical dispenser or proportioner that attaches to the auger that conveys seed into the drill box.

OR

Apply with any standard dry seed-treatment application equipment.

<b>Crop</b>	<b>Disease</b>	<b>Rate g/25 kg seed</b>
Barley	Smuts covered, false loose	50-66
Flax	Seedling blight, damping-off	112
Oats	Smuts	69-92
Rye	Bunt	28-43
Wheat	Bunt or stinking smut	26-40

Potatoes - early blight - start spraying when plants are 15 cm high; late blight - start in mid-July or when disease is reported in the area.

<b>Crop</b>	<b>Disease</b>	<b>Rate g/ac (kg/ha)</b>
Potato(1)*	Early blight, late blight	911 (2.25)
Sugar beet(14)*	Cercospora leaf spot	911 (2.25)

\*Note - Pre-harvest interval (days) given in brackets following crop.

Cost: \$5/kg

6. TOXICITY: Acute oral LD<sub>50</sub> (in mg/kg for rats): maneb (6750)

7. SAFETY PRECAUTIONS, STORAGE AND DISPOSAL: IF SWALLOWED - induce vomiting by touching the back of the tongue with a blunt object; repeat until vomit is clear. Take patient to nearest hospital taking the labelled container with you. IF ON SKIN - remove contaminated clothing and wash with soap and water. IF IN EYES - flush with plenty of water for 15 minutes and get medical attention.

Do not apply or allow to drift to areas occupied by unprotected persons or to streams, lakes or ponds to protect wildlife. Avoid contamination of feed or food, including such crops on which residue is unsafe.

Store product in a cool, dry place away from food or feed. Prevent the contents from becoming wet as this will reduce effectiveness and may cause flammable vapours. Keep away from fire and sparks. Burn empty bag; stay out of smoke.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**MERTECT (thiabendazole)**  
Chipman Inc.

1. FORMULATION: Suspension - Flowable (40% thiabendazole)
2. HOW IT WORKS: Thiabendazole is a fungicide which controls Fusarium, Helminthosporium, Oospora, Phoma and Rhizoctonia fungi.
3. NUMBER OF APPLICATIONS: One per season.
4. HOW TO APPLY:

With: Spray equipment.

Crop	Disease	Rate mL/1000 kg potatoes
Potatoes	Storage rot.	90 (suspension)

Water Volume: 8 L product/170 L water. Spray 2 litres of this suspension per metric tonne of potatoes.

Cost:

Application Tips: Potatoes must rotate along the conveyor line to ensure complete coverage.

5. TOXICITY: Acute oral LD<sub>50</sub> (in mg/kg for rats): thiabendazole (3,300).
6. SAFETY, PRECAUTIONS AND STORAGE: Symptoms of poisoning: may cause skin irritation.

Toxicological information: product contains petroleum distillates.

First aid: IF SWALLOWED - do NOT induce vomiting. Contact a physician. IF IN EYES - flush with plenty of water for 15 minutes. Contact a physician. IF ON SKIN - wash thoroughly with soap and water.

Wash hands, face and arms after use and before eating, drinking or smoking. Consult with manufacturer before mixing with other chemicals.

Do not reuse container - destroy when empty. When cleaning equipment or disposing of wastes, do not contaminate any water sources.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**ROVRAL (iprodione)**  
May and Baker Canada Inc.

1. FORMULATIONS: Wettable Powder (50% iprodione)  
Flowable (250 g iprodione/L)
2. HOW IT WORKS: Rovral is a protective and eradicant fungicide.
3. NUMBER OF APPLICATIONS: Refer to label — depends on crop.
4. HOW TO APPLY:

With: Ground or aircraft equipment.

Rates:	Crop	Disease	Rate	
			g/ac	(kg/ha)
	Canola	Sclerotinia	400-600 g	1.0-1.5
	Beans (white, kidney, snap)	Sclerotinia & Botrytis,	400-600 g	1.0-1.5

Water Volume: Canola 16 L/ac (40 L/ha) (aerial)  
Beans 16 L/ac (40 L/ha) (aerial)  
121 L/ac (300 L/ha) (ground)

Cost:

Application Tips: Spray mixture should be used on the day prepared. Addition of 405 g (1.0 kg/ha) nonionic wetter is recommended for improved fungicide performance. When disease is actively growing in beans, the infection may quickly exceed the point where 5% of plants show mould. Good spray coverage is essential. Do not spray in heavy dew or when rain is imminent.

5. TOXICITY: Acute oral LD<sub>50</sub> (in mg/kg for rats): iprodione (3,500).
6. SAFETY, PRECAUTIONS AND STORAGE: Avoid inhaling mist. A mild eye irritant. IF ON SKIN - wash with soap and water. IF IN EYES - flush with water. Do not contaminate domestic or irrigation water.

Store flowable above 0°C

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

**TERSAN, THIRAM 75 (thiram)**  
Uniroyal Chemical Ltd.

1. FORMULATIONS: Wettable Powder - (75% thiram)  
Suspension - Flowable (32.4% thiram)
2. REGISTERED MIXES: In various combinations with other fungicides (benomyl, carbathiin and phenylmercuric acetate) and, as dual purpose formulations, with insecticides (chlorfenvinphos, ethion, fensulfothion, fonophos and lindane).
3. HOW IT WORKS: Thiram is a protective fungicide applied as a foliar spray or a seed-treatment powder.
4. NUMBER OF APPLICATIONS: Seed treatments - one.
5. HOW TO APPLY:

With: With seed-treatment equipment.

<b>Crop</b>	<b>Disease</b>	<b>Rate g/mL/25 kg seed</b>
Alfalfa	Verticillium wilt	90 g wettable powder or 180 mL suspension
Canola, Mustard, Sugar beet	Seed decay, seedling blight, damping-off	100 g wettable powder
Bean (snap dry) Pea	Seed decay, seedling blight, damping-off	25-35 g wettable powder
Soybean		
Corn (sweet)	Seed decay, seedling blight, damping-off	55 g wettable powder
Cost:	\$12/kg	

Application Tips: Oilseeds - mix powder and seed in drill box. Simultaneous treatment with an insecticide for control of flea beetles is recommended (see also the sections on carbofuran and lindane).

6. TOXICITY: Acute oral LD<sub>50</sub> (in mg/kg for rats): thiram (375-865).
7. SAFETY PRECAUTIONS, STORAGE AND DISPOSAL: Symptoms of poisoning: May irritate eyes, nose, throat or skin. May cause allergic eczema in sensitive individuals.

First aid: IF IN EYES - immediately flush with plenty of water. Get medical attention. IF ON SKIN - wash with warm water and soap for 15 minutes.

Avoid breathing dust or spray mist. When treating, augering or handling treated seed, work in a well-ventilated area and wear goggles, gloves and a dust mask. Wash thoroughly after handling and before eating, drinking or smoking. Wash contaminated clothing with soap and hot water before wearing. Avoid alcoholic beverages 24 hours before and after working with thiram or thiram-treated seed because of unpleasant side-effects that may be incurred.

Store in a cool, dry, ventilated place away from food or feed. Keep away from heat, fire or sparks.

\*\*\*\*\*LABEL RATES ARE GIVEN ONLY IN QUANTITY OF PRODUCT PER HECTARE\*\*\*\*\*

	HERBICIDE SELECTOR CHART — CEREALS AND OILSEEDS																			
	BINDWEEDS	BLUEBUR	BUCKWHEAT (Tartary)	BUCKWHEAT (Wild)	CHAMOMILE (Scentless)	CHICKWEED (Common)	CLEAVERS	COCKLE (Cow)	DANDELION	DARNEL (Persian)	FLIXWEED	FOXTAIL (Green)	GRASS (Barnyard)	GROUNDSEL (Common)	HAWK'S BEARD (Narrow-Leaved)	HEMP-NETTLE	HENBIT	HORSETAIL (Field)	KNAWEL	KOCHIA
* Suppression only ¢ Weeds controlled or suppressed, based on preliminary data * Pre-crop emergence to weed seedlings " Used as a crop desiccant																				
<b>BARLEY</b>	Banvel* 2,4-D* Embutox E* Kil-Mor* Target* Tropotox Plus	Brominal M Bromox 450 Buctril M 2,4-D Estaprop MCPA* Phenoxylene Plus Sabre Stampede CM	Afolan & MCPA Banvel Blagal Brominal M Bromox 450 Buctril M Dyvel Estaprop Hoe-Grass II Kil-Mor Lorox & MCPA MCPA* Pardner Sabre Sencor & Mixes Stampede CM Target Torch Torch DS Tordon 202C	Afolan & MCPA Banvel Blagal Brominal M Bromox 450 Buctril M Dyvel Estaprop Hoe-Grass II Kil-Mor Lorox & MCPA MCPA* Pardner Sabre Sencor & Mixes Stampede CM Target Torch Torch DS Tordon 202C	Brominal M Bromox 450 Buctril M Dyvel Estaprop Hoe-Grass II Kil-Mor Lorox & MCPA MCPA* Pardner Sabre Sencor & Mixes Stampede CM Target Torch Torch DS Tordon 202C*	Afolan & MCPA Banvel Blagal Brominal M Bromox 450 Buctril M Dyvel Estaprop Hoe-Grass II Kil-Mor Lorox & MCPA MCPA* Pardner Sabre Sencor & Mixes Stampede CM Target Torch Torch DS Tordon 202C	Banvel Brominal M Bromox 450 Buctril M Dyvel Estaprop Hoe-Grass II Kil-Mor Lorox & MCPA MCPA* Pardner Sabre Sencor & Mixes Stampede CM Target Torch Torch DS Tordon 202C	Afolan & MCPA Banvel Blagal Brominal M Bromox 450 Buctril M Dyvel Estaprop Hoe-Grass II Kil-Mor Lorox & MCPA MCPA* Pardner Sabre Sencor & Mixes Stampede CM Target Torch Torch DS Tordon 202C	Hoe-Grass II Hoe-Grass 284	Blagal* Brominal M Bromox 450 Buctril M 2,4-D Dyvel Estaprop Kil-Mor Lorox & MCPA MCPA* Phenoxylene Plus Sabre Stampede CM Target Torch Torch DS Tordon 202C*	Afolan & MCPA Banvel Blagal Brominal M Bromox 450 Buctril M Dyvel Estaprop Hoe-Grass II Kil-Mor Lorox & MCPA MCPA* Pardner Sabre Sencor & Mixes Stampede CM Target Torch Torch DS Tordon 202C*	Afolan F & MCPA Brominal M Bromox 450 Buctril M Dyvel Estaprop Hoe-Grass II Kil-Mor Lorox & MCPA MCPA* Phenoxylene Plus Sabre Stampede CM Target Torch Torch DS Tordon 202C*	Embutox E & MCPA	Afolan & MCPA Blagal Buctril M & MCPA Dyvel Estaprop Glean Lexone Lorox & MCPA MCPA* MCPA-K64 Sencor & Mixes Target Tropotox Plus	Lexone & Mixes Sencor & Mixes	2,4-D*	Brominal M Bromox 450 Buctril M 2,4-D Dyvel Estaprop Glean Hoe-Grass II Lorox & MCPA MCPA Pardner Phenoxylene Plus Sabre Stampede CM Target Torch Torch DS	Afolan & MCPA Brominal M Bromox 450 Buctril M 2,4-D Dyvel Estaprop Glean Hoe-Grass II Lorox & MCPA MCPA Pardner Phenoxylene Plus Sabre Stampede CM Target Torch Torch DS		
<b>WHEAT</b>	Banvel* Cobutox 400* 2,4-D Butyric 400* 2,4-D* Embutox E* Kil-Mor* Phenoxylene Plus MCPA (salts)* Target* Tropotox Plus	Brominal M Bromox 450 Buctril M 2,4-D Estaprop MCPA* Phenoxylene Plus Sabre Stampede CM	Afolan & MCPA Banvel Blagal Brominal M Bromox 450 Buctril M Cobutox 400 2,4-D Butyric 400* Dyvel Estaprop Hoe-Grass II Kil-Mor* Lorox & MCPA MCPA* Pardner Sabre Sencor & Mixes Stampede CM Target Torch Torch DS Tordon 202C	Afolan & MCPA Banvel Blagal Brominal M Bromox 450 Buctril M Cobutox 400 2,4-D Butyric 400* Dyvel Estaprop Hoe-Grass II Kil-Mor* Lorox & MCPA MCPA* Pardner Sabre Sencor & Mixes Stampede CM Target Torch Torch DS Tordon 202C	Brominal M Bromox 450 Buctril M Dyvel Estaprop Hoe-Grass II Kil-Mor Lorox & MCPA MCPA* Pardner Sabre Sencor & Mixes Stampede CM Target Torch Torch DS Tordon 202C*	Afolan & MCPA Banvel Blagal Brominal M Bromox 450 Buctril M Dyvel Estaprop Hoe-Grass II Kil-Mor Lorox & MCPA MCPA* Pardner Sabre Sencor & Mixes Stampede CM Target Torch Torch DS Tordon 202C*	Afolan & MCPA Banvel Blagal Brominal M Bromox 450 Buctril M Dyvel Estaprop Hoe-Grass II Kil-Mor Lorox & MCPA MCPA* Pardner Sabre Sencor & Mixes Stampede CM Target Torch Torch DS Tordon 202C	Afolan & MCPA Banvel Blagal Brominal M Bromox 450 Buctril M Dyvel Estaprop Hoe-Grass II Kil-Mor Lorox & MCPA MCPA* Pardner Sabre Sencor & Mixes Stampede CM Target Torch Torch DS Tordon 202C	Hoe-Grass II Hoe-Grass 284	Blagal* Brominal M Bromox 450 Buctril M 2,4-D Dyvel Estaprop Heritage Hoe-Grass II Hoe-Grass 284 Lorox & MCPA MCPA* Phenoxylene Plus Sabre Stampede CM Target Torch Torch DS Tordon 202C*	Afolan F & MCPA Banvel Blagal Brominal M Bromox 450 Buctril M Dyvel Estaprop Hoe-Grass II Kil-Mor Lorox & MCPA MCPA* Phenoxylene Plus Sabre Stampede CM Target Torch Torch DS Tordon 202C*	Embutox E & MCPA	Afolan & MCPA Blagal Buctril M & MCPA Dyvel Estaprop Glean Lexone Lorox & MCPA MCPA* MCPA-K64 Sencor & Mixes Target Tropotox Plus	Lexone & Mixes Sencor & Mixes	Afolan & MCPA 2,4-D*	Brominal M* Bromox 450 Buctril M* Hoe-Grass II Pardner Sabre Torch Torch DS	Afolan & MCPA Brominal M Bromox 450 Buctril M 2,4-D Dyvel Estaprop Glean Heritage Hoe-Grass II Lorox & MCPA MCPA Pardner Phenoxylene Plus Sabre Stampede CM Torch Torch DS			
<b>OATS</b>	Banvel* Embutox E* Kil-Mor* Target* Tropotox Plus	Brominal M Bromox 450 Buctril M MCPA* Phenoxylene Plus Sabre Stampede CM	Afolan & MCPA Banvel Blagal Brominal M Bromox 450 Buctril M Cobutox 400 2,4-D Butyric 400 Dyvel Embutox E Kil-Mor Lorox & MCPA MCPA* Pardner Sabre Stampede CM Target Torch Torch DS	Afolan & MCPA Banvel Blagal Brominal M Bromox 450 Buctril M Cobutox 400 2,4-D Butyric 400 Dyvel Embutox E Kil-Mor Lorox & MCPA MCPA* Pardner Sabre Stampede CM Target Torch Torch DS	Brominal M Bromox 450 Buctril M Dyvel Embutox E Foil Glean Lorox & MCPA MCPA* Pardner Sabre Stampede CM Target Torch Torch DS	Afolan & MCPA Banvel Blagal Brominal M Bromox 450 Buctril M Dyvel Embutox E Foil Glean Lorox & MCPA MCPA* Pardner Sabre Stampede CM Target Torch Torch DS	Banvel Brominal M Bromox 450 Buctril M Dyvel Embutox E Foil Glean Lorox & MCPA MCPA* Pardner Sabre Stampede CM Target Torch Torch DS	Afolan & MCPA Banvel Blagal Brominal M Bromox 450 Buctril M Dyvel Embutox E Foil Glean Lorox & MCPA MCPA* Pardner Sabre Stampede CM Target Torch Torch DS	Afolan & MCPA Banvel Blagal Brominal M Bromox 450 Buctril M Dyvel Embutox E Foil Glean Lorox & MCPA MCPA* Pardner Sabre Stampede CM Target Torch Torch DS	Blagal* Brominal M Bromox 450 Buctril M Dyvel Embutox E Foil Glean Lorox & MCPA MCPA* Pardner Sabre Stampede CM Target Torch Torch DS	Afolan F & MCPA Banvel Blagal Brominal M Bromox 450 Buctril M Dyvel Embutox E Foil Glean Lorox & MCPA MCPA* Pardner Sabre Stampede CM Target Torch Torch DS	Embutox E & MCPA	Afolan & MCPA Blagal Buctril M & MCPA Dyvel Embutox E Foil Glean Lorox & MCPA MCPA* MCPA-K64 Pardner Sabre Stampede CM Target Torch Torch DS	Pardner* Torch Torch DS	Brominal M* Bromox 450 Buctril M* Pardner Sabre Torch Torch DS	Afolan & MCPA Brominal M Bromox 450 Buctril M Dyvel Embutox E Foil Glean Lorox & MCPA MCPA* MCPA-K64 Pardner Sabre Stampede CM Torch Torch DS				
<b>RAPESEED</b> (TTC - triazine)	Reglone!!	Reglone!!	Lontrel* Reglone!!	Lontrel Reglone!!	Reglone!! Rival	Benazolin*	Reglone!! Rival	Reglone!!	Basfapon Hoe-Grass 284	Reglone!!	Basfapon Hoe-Grass 284	Reglone!!	Basfapon Dalapon Hoe-Grass 284	Reglone!! Sencor (TTC)	Lontrel Reglone!!	Reglone!! Sencor (TTC) Spectrum	Reglone!!	Reglone!! Sencor (TTC)	Reglone!!	Reglone!! Rival







\* Suppression only  
 @ Grazing restrictions  
 & Weeds controlled or suppressed, based on preliminary research  
 !! Used as a crop desiccant

# HERBICIDE SELECTOR CHART - FORAGE CROPS

		Herbicide Selector Chart - Forage Crops															
Crops	Crop Stage	Abeinlh	Barley (Foxtail)	Bindweed (Field)	Bluebur	Brush (Alder, Aspen, Choke Cherry, Pasture Sage, Silverberry, Western Snowberry, Wild Rose, Willow)	Buckwheat (Wild)	Catchfly Night-Flowering	Chamomile (Scentless)	Chickweed	Dandelion	Foxtail (Green)	Grass (Barnyard)	Grass (Quack)	Groundsel (Common)	H	
Alfalfa (irr) under irrigation	Seedling		Eptam (ppi) Kerb	Cobutox 400* 2,4-D Butyric 400* Embutox E*	Asulox F@*	Mow	Asulox F@* Cobutox 400 2,4-D Butyric 400 Embutox E			Kerb Eptam (ppi)	Embutox E*	Asulox F@* Kerb Dalapon@ Eptam (ppi) Fusilade@ Hoe-Grass 284@	Asulox F@* Kerb Dalapon@ Eptam (ppi) Fusilade@ Hoe-Grass 284@	Amitrol T (spot)@ Dalapon@ Fusilade@ Kerb	Embutox E*	Embutox E*	
	Established	Reglone!!	Kerb Princep Reglone!! Sinbar*	Reglone!!	Asulox F@* Princep Reglone!! Sinbar	Mow	Asulox F@* Princep Reglone!! Sinbar	Princep Simadex Sencor (irr) Reglone!!	Reglone!!	Kerb Princep Reglone!! Sinbar	Reglone!! Sinbar	Asulox F@* Princep Reglone!! Sinbar Kerb	Asulox F@* Princep Reglone!! Sinbar Kerb	Amitrol T (spot)@ Dalapon@ Fusilade@ Kerb	Princp Reglone!! Sencor (irr)	Embutox E*	
Alsike Clover	Seedling			Cobutox 400* 2,4-D Butyric 400* Embutox E* Tropotox Plus		Mow	Cobutox 400 2,4-D Butyric 400 Embutox E Tropotox Plus*				Embutox E* Tropotox Plus*			Amitrol T (spot)@ Embutox E* Tropotox Plus*	Embutox E*	Embutox E*	
	Established					Mow									Amitrol T (spot)@		
Red Clover	Seedling			Tropotox Plus		Mow	Tropotox Plus*			Tropotox Plus*		Fusilade@		Amitrol T (spot)@ Fusilade@	Tropotox Plus*		
	Established	Reglone!!	Reglone!!	Reglone!!	Reglone!!	Mow	Reglone!!	Reglone!!	Reglone!!	Reglone!!	Reglone!!	Fusilade@ Reglone!!	Fusilade@ Reglone!!	Amitrol T (spot)@ Fusilade@ Reglone!!	Reglone!!	Reglone!!	Reglone!!
White Dutch Clover	Seedling			Cobutox 400* 2,4-D Butyric 400* Embutox E* Tropotox Plus		Mow	Cobutox 400 2,4-D Butyric 400 Embutox				Embutox E*			Amitrol T (spot)@ Embutox E* Tropotox Plus*	Embutox E*	Embutox E*	
	Established	Reglone!!	Reglone!!	Reglone!!	Reglone!!	Mow	Reglone!!	Reglone!!	Reglone!!	Reglone!!	Reglone!!	Reglone!!	Reglone!!	Amitrol T (spot)@ Reglone!!	Reglone!!	Reglone!!	Reglone!!
Sweet Clover	Seedling					Mow									Amitrol T (spot)@		
	Established					Mow									Amitrol T (spot)@		
Bird's-foot Trefoil	Seedling		Eptam (ppi) Kerb	Cobutox 400* 2,4-D Butyric 400* Embutox E*		Mow	Cobutox 400 2,4-D Butyric 400 Embutox			Eptam (ppi) Kerb	Embutox E*	Dalapon@ Eptam (ppi) Fusilade@ Kerb	Dalapon@ Eptam (ppi) Fusilade@ Kerb	Amitrol T (spot)@ Dalapon@ Fusilade@ Kerb	Embutox E*	Embutox E*	
	Established	Reglone!!	Kerb Princep Reglone!!	Reglone!!	Princep Reglone!!	Mow	Princep Reglone!!	Princep Reglone!!	Reglone!!	Kerb Princep Reglone!!	Reglone!!	Dalapon@ Fusilade@ Kerb Princep Reglone!!	Dalapon@ Fusilade@ Kerb Princep Reglone!!	Amitrol T (spot)@ Dalapon@ Fusilade@ Kerb	Reglone!!	Reglone!!	Reglone!!
Sainfoin	Seedling					Mow									Amitrol T (spot)@		
	Established					Mow									Amitrol T (spot)@		
Brome grass	Seedling				Buctril M	Mow	Buctril M Pardner Torch Torch DS	Buctril M Pardner Torch Torch DS						Amitrol T (spot)@ Buctril M Pardner Torch Torch DS	Buctril M Pardner Torch Torch DS	2,4-D (Fall)	
	Established	2,4-D* Mow & 2,4-D		2,4-D*	2,4-D	2,4-D* Mow	MCPA				2,4-D			Amitrol T (spot)@ Buctril M Pardner Torch Torch DS			
Crested Wheatgrass	Seedling				Buctril M	Mow	Buctril M Pardner Torch Torch DS	Pardner Torch Torch DS	Buctril M Pardner Torch Torch DS			Hoe-Grass 284@	Hoe-Grass 284@	Amitrol T (spot)@ Buctril M Pardner Torch Torch DS	Buctril M Pardner Torch Torch DS		
	Established	2,4-D* Mow & 2,4-D		2,4-D*	2,4-D	2,4-D* Mow					2,4-D			Amitrol T (spot)@ Buctril M Pardner Torch Torch DS			
Intermediate	Seedling				Buctril M	Mow	Buctril M Pardner Torch Torch DS	Pardner Torch Torch DS	Buctril M Pardner Torch Torch DS					Amitrol T (spot)@ Buctril M Pardner Torch Torch DS	Buctril M Pardner Torch Torch DS		

	GRASS (Quack)	GROUNDSEL (Common)	HAWK'S-BEARD (Narrow-Leaved)	KNAPWEED (Diffuse, Spotted)	LAMB'S- QUARTERS	LETTUCE (Blue)	MUSTARDS	CATS (Wild)	PIGWEEED (Prostrate, Redroot Tumble)	SHEPHERD'S PURSE	SMARTWEEDS	SOW-THISTLE (Annual, Perennial)	SPURGE (Leafy)	STINKWEED	THISTLE (Canada)	TOADFLAX		
	Amitrol T (spot)@ Dalapon@ Fusilade@ Kerb@ Reglone!! Sinbar*	Embutox E*	Embutox E & MCPA		Cobutox 400 2,4-D Butyric 400 Embutox E Eptam (ppi)	Embutox E*	Asulox F* @ Cobutox 400 2,4-D Butyric 400 Embutox E	Asulox F@ Avadex BW@ Avenge 200C@ Carbyne 2EC@ Kerb Eptam (ppi)	Cobutox 400 2,4-D Butyric 400 Embutox E Eptam (ppi)	Cobutox 400 2,4-D Butyric 400 Embutox E	Asulox F@ Cobutox 400 2,4-D Butyric 400 Embutox E	Amitrol T (spot)@ Embutox E	Amitrol T (spot)@	Asulox F* @ Cobutox 400 2,4-D Butyric 400 Embutox E	Amitrol T (spot)@ Cobutox 400* 2,4-D Butyric 400* Embutox E*	Amitrol T (spot)@		
	Amitrol T (spot)@ Dalapon@ Fusilade@ Kerb Reglone!! Sinbar*	Princep Reglone!! Sencor (irr)	Embutox E & MCPA (Fall Spraying) Reglone!!	Reglone!!!	Princep Reglone!! Sencor (irr) Sinbar	Princep Reglone!!	Asulox F@ Sinbar Reglone!! Sencor (irr) Sinbar	Asulox F@ Sinbar Reglone!! Sencor (irr) Sinbar	Reglone!! Sencor (irr) Sinbar	Asulox F@ Sinbar Reglone!! Sencor (irr)	Reglone!! Sinbar	Amitrol T (spot)@ Reglone!! Sencor (irr)	Amitrol T (spot)@ Reglone!! Sencor (annual)	Asulox F* @ Sinbar Princep Reglone!! Sencor (irr)	Amitrol T (spot)@ Reglone!! Sencor (irr)	Amitrol T (spot)@ Reglone!!		
	Amitrol T (spot)@	Embutox E* Tropotox Plus*	Embutox E & MCPA		Cobutox 400 2,4-D Butyric 400 Embutox E Tropotox Plus	Embutox E* Tropotox Plus*	Cobutox 400 2,4-D Butyric 400 Embutox E Tropotox Plus	Avadex BW@ Carbyne 2EC@	Cobutox 400 2,4-D Butyric 400 Embutox E Tropotox Plus	Cobutox 400 2,4-D Butyric 400 Embutox E Tropotox Plus	Cobutox 400 2,4-D Butyric 400 Embutox E Tropotox Plus	Amitrol T (spot)@ Embutox E Tropotox Plus	Amitrol T (spot)@	Cobutox 400 2,4-D Butyric 400 Embutox E Tropotox Plus	Amitrol T (spot)@ Cobutox 400* 2,4-D Butyric 400* Embutox E* Tropotox Plus	Amitrol T (spot)@		
	Amitrol T (spot)@							Carbyne 2EC@					Amitrol T (spot)@	Amitrol T (spot)@		Amitrol T (spot)@	Amitrol T (spot)@	
	Amitrol T (spot)@ Fusilade@	Tropotox Plus*			Tropotox Plus	Tropotox Plus*	Tropotox Plus	Avadex BW@ Avenge 200C@ Carbyne 2EC@ Fusilade@ Hoe-Grass 284@	Tropotox Plus	Tropotox Plus	Tropotox Plus	Amitrol T (spot)@ Tropotox Plus	Amitrol T (spot)@	Tropotox Plus	Amitrol T (spot)@ Tropotox Plus	Amitrol T (spot)@ Tropotox Plus	Amitrol T (spot)@	
	Amitrol T (spot)@ Fusilade@ Reglone!!	Reglone!!	Reglone!!	Reglone!!!	Reglone!!	Reglone!!	Reglone!!	Fusilade@ Reglone!!	Reglone!!	Reglone!!	Reglone!!	Amitrol T (spot)@ Reglone!!	Amitrol T (spot)@ Reglone!!	Reglone!!	Amitrol T (spot)@ Reglone!!	Amitrol T (spot)@ Reglone!!	Amitrol T (spot)@ Reglone!!	
	Amitrol T (spot)@ Embutox E* Tropotox Plus*	Embutox E & MCPA			Cobutox 400 2,4-D Butyric 400 Embutox E Tropotox Plus	Embutox E*	Cobutox 400 2,4-D Butyric 400 Embutox E Tropotox Plus	Avadex BW@	Cobutox 400 2,4-D Butyric 400 Embutox E Tropotox Plus	Cobutox 400 2,4-D Butyric 400 Embutox E Tropotox Plus	Cobutox 400 2,4-D Butyric 400 Embutox E Tropotox Plus	Amitrol T (spot)@ Embutox E Tropotox Plus	Amitrol T (spot)@	Cobutox 400 2,4-D Butyric 400 Embutox E Tropotox Plus	Amitrol T (spot)@ Cobutox 400* 2,4-D Butyric 400* Embutox E* Tropotox Plus	Amitrol T (spot)@		
	Amitrol T (spot)@ Reglone!!	Reglone!!	Reglone!!!	Reglone!!!	Reglone!!	Reglone!!	Reglone!!	Reglone!!	Reglone!!	Reglone!!	Reglone!!	Amitrol T (spot)@ Reglone!!	Amitrol T (spot)@ Reglone!!	Reglone!!	Amitrol T (spot)@ Reglone!!	Amitrol T (spot)@ Reglone!!	Amitrol T (spot)@ Reglone!!	
	Amitrol T (spot)@							Avadex BW@ Avenge 200C@ Carbyne 2EC@ Hoe-Grass 284@				Amitrol T (spot)@	Amitrol T (spot)@			Amitrol T (spot)@	Amitrol T (spot)@	
	Amitrol T (spot)@							Carbyne 2EC@				Amitrol T (spot)@	Amitrol T (spot)@			Amitrol T (spot)@	Amitrol T (spot)@	
	Amitrol T (spot)@ Dalapon@ Fusilade@ Kerb@	Embutox E*	Embutox E & MCPA		Cobutox 400 2,4-D Butyric 400 Embutox E Eptam (ppi)	Embutox E*	Cobutox 400 2,4-D Butyric 400 Embutox E	Avadex BW@ Avenge 2EC@ Eptam (ppi) Fusilade@ Kerb	Cobutox 400 2,4-D Butyric 400 Embutox E Eptam (ppi)	Cobutox 400 2,4-D Butyric 400 Embutox E Eptam (ppi)	Cobutox 400 2,4-D Butyric 400 Embutox E	Amitrol T (spot)@ Embutox E	Amitrol T (spot)@	Cobutox 400 2,4-D Butyric 400 Embutox E	Amitrol T (spot)@ Cobutox 400* 2,4-D Butyric 400* Embutox E*	Amitrol T (spot)@		
	Amitrol T (spot)@ Reglone!! Dalapon@ Fusilade@	Princep Reglone!!	Reglone!!!	Reglone!!!	Princep Reglone!!	Princep Reglone!!	Princep Reglone!!	Fusilade@ Kerb@ Princep Reglone!!	Princep Reglone!!	Princep Reglone!!!	Princep Reglone!!	Amitrol T (spot)@ Reglone!!	Amitrol T (spot)@ Reglone!!	Princep Reglone!!	Amitrol T (spot)@ Reglone!!	Amitrol T (spot)@ Reglone!!	Amitrol T (spot)@ Reglone!!	
	Amitrol T (spot)@											Amitrol T (spot)@	Amitrol T (spot)@			Amitrol T (spot)@	Amitrol T (spot)@	
	Amitrol T (spot)@							Carbyne 2EC@				Amitrol T (spot)@	Amitrol T (spot)@			Amitrol T (spot)@	Amitrol T (spot)@	
	Amitrol T (spot)@ Dalapon@ Fusilade@ Kerb@ Reglone!! Sinbar*	Embutox E*	Embutox E & MCPA		Cobutox 400 2,4-D Butyric 400 Embutox E Eptam (ppi)	Embutox E*	Cobutox 400 2,4-D Butyric 400 Embutox E	Avadex BW@ Avenge 200C@ Carbyne 2EC@ Hoe-Grass 284@ Mataven@	Cobutox 400 2,4-D Butyric 400 Embutox E Eptam (ppi)	Cobutox 400 2,4-D Butyric 400 Embutox E Eptam (ppi)	Cobutox 400 2,4-D Butyric 400 Embutox E	Amitrol T (spot)@ Embutox E	Amitrol T (spot)@	Cobutox 400 2,4-D Butyric 400 Embutox E	Amitrol T (spot)@ Cobutox 400* 2,4-D Butyric 400* Embutox E*	Amitrol T (spot)@		
	Amitrol T (spot)@ Reglone!! Dalapon@ Fusilade@	Princep Reglone!!	Reglone!!!	Reglone!!!	Princep Reglone!!	Princep Reglone!!	Princep Reglone!!	Fusilade@ Kerb@ Princep Reglone!!	Princep Reglone!!	Princep Reglone!!!	Princep Reglone!!	Amitrol T (spot)@ Reglone!!	Amitrol T (spot)@ Reglone!!	Princep Reglone!!	Amitrol T (spot)@ Reglone!!	Amitrol T (spot)@ Reglone!!	Amitrol T (spot)@ Reglone!!	
	Amitrol T (spot)@											Amitrol T (spot)@	Amitrol T (spot)@			Amitrol T (spot)@	Amitrol T (spot)@	
	Amitrol T (spot)@							Carbyne 2EC@				Amitrol T (spot)@	Amitrol T (spot)@			Amitrol T (spot)@	Amitrol T (spot)@	
	Amitrol T (spot)@ Dalapon@ Fusilade@ Kerb@ Reglone!! Sinbar*	Buctril M Pardner Torch Torch DS			Buctril M Pardner Torch Torch DS		Buctril M Pardner Torch Torch DS	Avenge 200@ Carbyne 2EC@ Hoe-Grass 284@ Mataven@	Buctril M Pardner Torch Torch DS	Buctril M Pardner Torch Torch DS	Buctril M	Buctril M	Buctril M*		Buctril M Pardner Torch Torch DS	Buctril M*		
	Amitrol T (spot)@		2,4-D (Fall Spraying)	2,4-D (seedling control only)*	2,4-D MCPA	2,4-D*	2,4-D			2,4-D	2,4-D MCPA			2,4-D	2,4-D (seedling control only) MCPA*	2,4-D MCPA	2,4-D* MCPA	2,4-D (high rate)
	Amitrol T (spot)@	Buctril M Pardner Torch Torch DS			Buctril M Pardner Torch Torch DS		Buctril M Pardner Torch Torch DS	Avenge 200@ Carbyne 2EC@ Hoe-Grass 284@ Mataven@	Buctril M Pardner Torch Torch DS	Buctril M Pardner Torch Torch DS	Buctril M	Buctril M	Buctril M*		Buctril M Pardner Torch Torch DS	Buctril M*		
	Amitrol T (spot)@																	
	Amitrol T (spot)@			2,4-D (seedling control only)*	2,4-D	2,4-D*	2,4-D		2,4-D	2,4-D			2,4-D	2,4-D (seedling control only)	2,4-D	2,4-D*	2,4-D* (high rate)	
	Amitrol T (spot)@	Buctril M Pardner Torch Torch DS			Buctril M Pardner Torch Torch DS		Buctril M Pardner Torch Torch DS	Mataven@	Buctril M Pardner Torch Torch DS	Buctril M Pardner Torch Torch DS	Buctril M	Buctril M	Buctril M*		Buctril M Pardner Torch Torch DS	Buctril M*		
	Amitrol T (spot)@																	
	Amitrol T (spot)@			2,4-D (seedling control only)*	2,4-D	2,4-D*	2,4-D		2,4-D	2,4-D			2,4-D	2,4-D (seedling control only)	2,4-D	2,4-D*	2,4-D* (high rate)	

Species	Stage	Pre-Emergent		Post-Emergent		Control		Pre-Emergent		Post-Emergent		Control		Comments	
		Product	Rate	Product	Rate	Product	Rate	Product	Rate	Product	Rate	Product	Rate		
Brome grass	Seedling			Buctril M	Mow	Buctril M Pardner Torch Torch DS		Buctril M Pardner Torch Torch DS						Amitrol T (spot)@	Buctril M Pardner Torch Torch DS
	Established	2,4-D* Mow & 2,4-D		2,4-D*	2,4-D	2,4-D* Mow		MCPA			2,4-D				Amitrol T (spot)@
Crested Wheatgrass	Seedling			Buctril M	Mow	Buctril M Pardner Torch Torch DS	Pardner Torch Torch DS	Buctril M Pardner Torch Torch DS			Hoe-Grass 284@	Hoe-Grass 284@	Amitrol T (spot)@	Buctril M Pardner Torch Torch DS	
	Established	2,4-D* Mow & 2,4-D		2,4-D*	2,4-D	2,4-D* Mow				2,4-D				Amitrol T (spot)@	
Intermediate Wheatgrass	Seedling			Buctril M	Mow	Buctril M Pardner Torch Torch DS	Pardner Torch Torch DS	Buctril M Pardner Torch Torch DS					Amitrol T (spot)@	Buctril M Pardner Torch Torch DS	
	Established	2,4-D* Mow & 2,4-D		2,4-D*	2,4-D	2,4-D* Mow				2,4-D				Amitrol T (spot)@	
Seed Only	Seedling			Buctril M	Mow	Buctril M Pardner Torch Torch DS	Pardner Torch Torch DS	Buctril M Pardner Torch Torch DS					Amitrol T (spot)@	Buctril M Pardner Torch Torch DS	
	Established	2,4-D* Mow & 2,4-D		2,4-D*	2,4-D	2,4-D* Mow				2,4-D				Amitrol T (spot)@	
	Creeping Red Fescue			Banvel*	Buctril M	Banvel@ Mow		Banvel@ Pardner Torch Torch DS	Banvel@ Buctril M Pardner Torch Torch DS		Hoe-Grass 284@	Hoe-Grass 284@	Amitrol T (spot)@	Buctril M Pardner Torch Torch DS	
Russian Wild Rye	Established	Mow & 2,4-D		Banvel* Banvel & 2,4-D*	2,4-D	Banvel@ Banvel & 2,4-D Mow	Banvel@	Banvel@	Banvel@	2,4-D				Amitrol T (spot)@	
	Seedling			Buctril M	Mow	Buctril M Pardner Torch Torch DS	Pardner Torch Torch DS	Buctril M Pardner Torch Torch DS			Hoe-Grass 284@	Hoe-Grass 284@	Amitrol T (spot)@	Buctril M Pardner Torch Torch DS	
Timothy	Established	Mow & 2,4-D		2,4-D*	2,4-D	2,4-D* Mow				2,4-D				Amitrol T (spot)@	
	Seedling			Buctril M	Mow	Buctril M Pardner Torch Torch DS	Pardner Torch Torch DS	Buctril M Pardner Torch Torch DS					Amitrol T (spot)@	Buctril M Pardner Torch Torch DS	
Hay and Grazing	With Legumes			Cobutox 400* 2,4-D Butyric 400* Embutox E* Tropotox Plus		2,4-D Ester - Dormant Season	Cobutox 400 2,4-D Butyric 400 Embutox Tropotox Plus*		Kerb	Cobutox 400 2,4-D Butyric 400 Embutox E* Tropotox Plus*				Amitrol T (spot)@	
	No Legumes	Banvel* @ Mow & 2,4-D@	Kerb	Banvel* @ Embutox E@ Cobutox 400* Tropotox Plus 2,4-D 2,4-D Butyric 400*	2,4-D MCPA	Banvel@ 2,4-D	Banvel* @ Embutox E Cobutox 400 MCPA* 2,4-D* 2,4-D Butyric 400*	Banvel* @	Banvel* @	Banvel* @ Embutox E Cobutox 400 Tropotox Plus 2,4-D@					



\* Suppression only  
 © Weeds controlled or suppressed based on preliminary research  
 @ Grazing or feeding restrictions  
 # Pre-crop emergence to weed seedlings  
 !! Used as a crop desiccant

# HERBICIDE SELECTOR CHART – OTHER CROPS

	BUCKWHEAT (Tartary)	BUCKWHEAT (Wild)	CHICKWEED	COCKLEBUR	COCKLE (Cow)	DARNEL (Persian)	FOXTAIL (Green)	GOOSEFOOT	GRASS (Barnyard)	GROUNDSEL (Common)	HEMP-NETTLE	KNOTWEED	KOCHIA	LAMB'S- QUARTERS	MUSTARDS	NIGH	
<b>BEANS (Snap and Dry)</b> • Check label to ensure chosen chemical or mix is registered for use on the crop.	Gramoxone#	Gramoxone# Rival Treflan	Amiben Basagran@ Eptam Gramoxone# Patoran Rival Treflan	Basagran@ Gramoxone#	Gramoxone# Rival Treflan	Gramoxone# Hoe-Grass 284 Rival Treflan	Amiben Dual Eptam Hoe-Grass 284 Gramoxone# Patoran Rival Treflan	Gramoxone#	Amiben Dual Eptam Gramoxone# Hoe-Grass 284 Patoran Rival Treflan	Basagran Gramoxone# Patoran	Gramoxone#	Gramoxone# Rival Treflan	Gramoxone#	Amiben Basagran Eptam Gramoxone# Patoran Rival Treflan	Amiben Basagran@ Gramoxone# Patoran	Basagran Eptam Gramoxone#	
<b>CANARY SEED</b>	Banvel Brominal M Torch DS	Banvel Brominal M Torch DS	Bromox 450*	Buctril M	Banvel Brominal M Torch DS	Bromox Buctril M Pardner Sabre	Brominal M Buctril M Pardner Sabre Torch DS	Buctril M & MCPA	Brominal M Buctril M Pardner Sabre Torch DS	Brominal M Bromox 450 Buctril M Pardner Sabre Torch DS	Brominal M Bromox 450 Buctril M Pardner Sabre Torch DS	Brominal M Bromox 450 Buctril M Pardner Sabre Torch DS	Brominal M Bromox 450 Buctril M Pardner Sabre Torch DS	Brominal M Bromox 450 Buctril M Pardner Sabre Torch DS	Brominal M Bromox 450 Buctril M Pardner Sabre Torch DS	Brominal M Bromox 450 Buctril M Pardner Sabre Torch DS	Brominal M Bromox 450 Buctril M Pardner Sabre Torch DS
<b>CARROTS AND PARSNIPS (c - carrots)</b>	Lorox L (c)	Afolan F Lorox L (c) Rival (c) Treflan (c)	Afolan F Amiben (c) Lorox L (c) Rival (c) Treflan (c)		Afolan F Lorox L (c) Rival (c)	Rival (c) Treflan (c)	Afolan F@ Amiben (c) Lorox L (c) Rival (c) Treflan (c)	Afolan F@ Lorox L (c)	Afolan F Amiben (c) Lorox L (c) Rival (c) Treflan (c)	Afolan F@ Lorox L (c)	Afolan F@ Lorox L (c) Rival (c) Treflan (c)	Afolan F@ Lorox L (c)	Afolan F@ Lorox L (c) Rival (c) Treflan (c)	Afolan F@ Lorox L (c)	Afolan F@ Lorox L (c)	Afolan F@ Lorox L (c)	
<b>CORN • Check label to ensure chosen chemical or mix is registered for use on the crop. FC (Field Corn)</b>	Banvel Kil-Mor Pardner Torch DS	Afolan F Atrazine Banvel Bladex Buctril M Embutox E (FC) Kil-Mor Lorox L Pardner Primextra Princep Simadex Torch DS	Afolan F Eradicane 8-E Banvel 2,4-D Amine Buctril M Lorox L Princep Simadex	Basagran@ Buctril M 2,4-D Amine Embutox E (FC) Kil-Mor Lorox L Pardner Torch DS	Afolan F Banvel 2,4-D Amine Buctril M Kil-Mor Lorox L Princep Simadex	Afolan F Atrazine Bladex Dual & Mixes Eradicane Lorox L Primextra Princep Simadex	Afolan F@ 2,4-D Amine	Afolan F@ Atrazine Bladex Dual & Mixes Eradicane Lorox L Primextra Princep Simadex	Afolan F@ Basagran@ Buctril M Laddok Lorox L Pardner Torch DS	Buctril M Tropotox Plus (FC)	Afolan F@ Bladex Kil-Mor Lorox L Tropotox Plus (FC)	Afolan F@ Buctril M 2,4-D Amine & Ester Kil-Mor Laddok Lorox L Pardner Primextra Princep Simadex Torch DS Tropotox Plus (FC)	Afolan F@ Atrazine Basagran@ Bladex Kil-Mor Lorox L Pardner Torch DS	Afolan F@ Atrazine Basagran@ Bladex Kil-Mor Lorox L Pardner Primextra Princep Simadex Torch DS Tropotox Plus (FC)	Afolan F@ Atrazine Basagran@ Bladex Kil-Mor Lorox L Pardner Primextra Princep Simadex Torch DS Tropotox Plus (FC)	Atrazine Basagran Bladex Eradicane Laddok	
<b>FABABEANS</b>	Sencor	Rival Treflan	Basagran@ Lexone Rival Sencor Treflan	Basagran@	Rival Treflan	Hoe-Grass 284 Rival Treflan	Hoe-Grass 284 Rival Treflan	Hoe-Grass 284 Rival Treflan	Basagran@ Sencor	Lexone Sencor	Rival Treflan			Basagran@ Lexone Rival Sencor Treflan	Basagran@ Lexone Rival Sencor	Basagran@	
<b>LENTILS</b>	Sencor	Rival Treflan	Lexone Rival Sencor Treflan		Rival Treflan	Hoe-Grass 284 Rival Treflan	Hoe-Grass 284 Rival Treflan	Hoe-Grass 284 Rival Treflan	Sencor	Lexone Sencor	Rival Treflan			Lexone Rival Sencor Treflan	Lexone Sencor		
<b>PEAS (Field and Processing)</b> • Check label to ensure chosen chemical or mix is registered for use on the crop.	MCPA* Amine & Salts Reglone!! Sencor	MCPA* Amine & Salts Reglone!! Rival Treflan	Basagran@ Lexone Phenoxylene Plus Rival Sencor Treflan	Basagran@ MCBA* Amine & Salts Phenoxylene Plus Reglone!! Rival Sencor Treflan	Reglone!! Rival Treflan	Basfapon@ Dalapon@ Hoe-Grass 284 Reglone!! Rival Treflan	Basfapon@ Dalapon@ Hoe-Grass 284 Reglone!! Rival Treflan	MCBA* Amine & Salts Reglone!!	Basfapon@ Dalapon@ Hoe-Grass 284 Reglone!! Sodium TCA (field) Rival Treflan	Basagran@ Reglone!! Sencor	Lexone MCBA* Amine & Salts Reglone!! Sencor Tropotox Tropotox Plus	Reglone!! Rival Treflan Tropotox Plus	Phenoxylene Plus Reglone!!	Basagran@ Lexone MCBA* Amine & Salts Phenoxylene Plus Reglone!! Rival Sencor Treflan Tropotox Tropotox Plus	Basagran@ Lexone MCBA* Amine & Salts Phenoxylene Plus Reglone!! Sencor Tropotox Tropotox Plus	Basagran@ Lexone MCBA* Amine & Salts Phenoxylene Plus Reglone!! Rival Sencor Treflan Tropotox Tropotox Plus	
<b>POTATOES</b>	Gramoxone#	Afolan F	Afolan F	Gramoxone#	Gramoxone#	Basfapon	Alolan F Basfapon@	Afolan F Basfapon@	Afolan F@ Basfapon@	Gramoxone# Lorox L	Afolan F@ Gramoxone#	Afolan F@ Gramoxone#	Afolan F@ Gramoxone#	Alolan F Eptam	Afolan F Gramoxone#	Eptam Gramoxone#	

	MUSTARDS	NIGHTSHADE	OATS (Wild)	PIGWEED (Prostrate)	POWDERWEED (Redroot)	PURSLANE	RADISH (Wild)	RAPESEED (Volunteer)	SMARTWEEDS	SOW-THISTLE (Annual, Perennial)	SPURRY (Corn)	STINKWEED	THISTLE (Canada)	THISTLE (Russian)	VOLUNTEER CEREALS	
	Amiben Basagran®@ Eptam Gramoxone®# Patoran	Basagran®@ Eptam Gramoxone®# Patoran	Eptam Hoe-Grass 284 Gramoxone®# Rival Treflan	Amiben Eptam Gramoxone®# Patoran Rival Treflan	Amiben Basagran®@ Eptam Gramoxone®# Patoran Rival Treflan	Basagran®@ Eptam Gramoxone®# Patoran Rival Treflan	Basagran®@ Gramoxone®#	Basagran®@ Gramoxone®# Patoran	Amiben Basagran®@ Gramoxone®# Patoran	Gramoxone®#	Basagran®@ Eptam Gramoxone®# Patoran	Amiben Basagran®@ Gramoxone®# Patoran	Basagran®@ Gramoxone®# Rival Treflan	Eptam Gramoxone®# Treflan		
Brominal M Bromox 450 Buctril M Pardner Sabre Torch Torch DS		Avenge Mataven		Brominal M Bromox 450 Buctril M Pardner Sabre Torch Torch DS			Brominal M Bromox 450 Buctril M Pardner Sabre Torch	Banvel Torch DS	Brominal M* Bromox 450*(P) Buctril M*	Banvel	Brominal M Bromox 450 Buctril M Pardner Sabre Torch Torch DS	Buctril M* Brominal M*	Brominal M Bromox 450 Buctril M Pardner Sabre Torch Torch DS			
Afolan F®@ Lorox L (c)		Rival (c) Treflan (c)	Afolan F®@ Amiben (c) Lorox L (c) Rival (c) Treflan (c)	Afolan F®@ Amiben (c) Lorox L (c) Rival (c) Treflan (c)	Afolan F®@ Lorox L (c)	Afolan F®@ Lorox L (c)	Afolan F®@ Lorox L (c)	Afolan F Amiben (c) Lorox L (c)	Afolan F (seedling) Lorox L (c)(A)	Afolan F Amiben (c) Lorox L (c)	Afolan F Lorox L (c)	Lorox L (c)*	Rival (c) Treflan (c)			
Afolan F Atrazine Basagran®@ Bladex Buctril M 2,4-D Amine + ester Embutox E (FC) Kil-Mor Laddok Lorox L Pardner Primextra Torch Torch DS Tropotox Plus (FC)	Atrazine Basagran Bladex Eradicane Laddok	Atrazine Eradicane 8-E Princept Simadex	Afolan F Atrazine Bladex 2,4-D Amine Eradicane 8-E Kil-Mor Lorox L Primextra	Afolan F Atrazine Bladex Basagran®@ Buctril M 2,4-D Amine@ Eradicane 8-E Kil-Mor Lorox L Primextra Princept Simadex Tropotox Plus (FC)	Afolan F Atrazine Bladex Basagran®@ Buctril M 2,4-D Amine@ Eradicane 8-E Laddok Lorox L Primextra Princept Simadex Tropotox Plus (FC)	Afolan F®@ Basagran®@ 2,4-D Amine® & Salts** Although not registered for this use, those products registered to control mustards might be expected to safely control volunteer rapeseed.	Basagran®@ 2,4-D Amine® & Salts** Although not registered for this use, those products registered to control mustards might be expected to safely control volunteer rapeseed.	Afolan F®@ Atrazine Banvel Basagran®@ Bladex Buctril M Embutox E (FC) Kil-Mor Laddok Lorox L (A) Tropotox Plus (FC)	Afolan F®@ Atrazine Banvel & Mixes Buctril M*(P) 2,4-D Amine Embutox E (FC) Kil-Mor Laddok Lorox L (A) Tropotox Plus (FC)	Afolan F®@ Atrazine Banvel Basagran®@ Bladex Buctril M Embutox E (FC) Kil-Mor Laddok Lorox L (A) Tropotox Plus (FC)	Afolan F®@ Atrazine Banvel Basagran®@ Bladex Buctril M Embutox E (FC) Kil-Mor Laddok Lorox L (A) Tropotox Plus (FC)	Amitrol T (spot) Banvel* Basagran®@ Buctril M* 2,4-D* Embutox E (FC) Kil-Mor Lorox L Pardner Princept Simadex Torch Torch DS Tropotox Plus (FC)	Amitrol T (spot) Banvel* Basagran®@ Buctril M* 2,4-D* Embutox E (FC) Kil-Mor Lorox L Pardner Princept Simadex Torch Torch DS Tropotox Plus (FC)	Basagran®@ Buctril M 2,4-D Amine Kil-Mor Laddok Pardner Sabre Torch Torch DS	Atrazine Eradicane 8-E	
Basagran®@ Lexone Sencor	Basagran®@	Carbyne 2EC Hoe-Grass 284 Rival Treflan	Rival Treflan	Basagran®@ Lexone Rival Sencor Treflan	Basagran®@ Rival Treflan	Basagran®@	Basagran®@ Lexone Sencor	Basagran®@ Lexone Sencor		Basagran®@ Lexone Sencor	Basagran®@ Lexone Sencor	Basagran®@	Basagran®@ Rival Sencor Treflan	Treflan*		
Lexone Sencor		Carbyne 2EC Hoe-Grass 284 Rival Treflan	Rival Treflan	Lexone Rival Sencor Treflan	Rival Treflan		Lexone Sencor	Lexone Sencor		Lexone Sencor	Lexone Sencor		Rival Sencor Treflan			
Salts	Basagran®@ Lexone MCPA® Amine & Salts Phenoxylene Plus Reglone!! Sencor Tropotox Tropotox Plus	Basagran®@ Regione!!	Avadex BW Basifapon Carbyne Dalapon Hoe-Grass 284 Reglone!! Rival Treflan	MCPA® Amine & Salts** Regione!! Rival Treflan	Basagran MCPA® Amine & Salts Phenoxylene Plus Reglone!! Rival Treflan Tropotox Tropotox Plus	Basagran®@ MCPA® Amine & Salts Phenoxylene Plus Reglone!! Rival Treflan Tropotox Tropotox Plus	Basagran®@ MCPA® Amine & Salts Phenoxylene Plus Reglone!! Sencor	Basagran®@ Lexone MCPA® Amine & Salts Phenoxylene Plus Reglone!! Sencor Tropotox Tropotox Plus	Basagran®@ Lexone MCPA® Amine & Salts Phenoxylene Plus Reglone!! Sencor Tropotox Tropotox Plus	Amitrol T (spot) Basagran®@ Lexone MCPA® Amine & Salts Phenoxylene Plus (annual) Reglone!! Sencor Tropotox Tropotox Plus	Basagran®@ Lexone MCPA® Amine & Salts Phenoxylene Plus Reglone!! Sencor Tropotox Tropotox Plus	Amitrol T (spot) Basagran®@ Lexone MCPA® Amine & Salts Phenoxylene Plus Reglone!! Sencor Tropotox Tropotox Plus	Amitrol T (spot) Basagran®@ Lexone MCPA® Amine & Salts Phenoxylene Plus Reglone!! Sencor Tropotox Tropotox Plus	Basagran®@ Reglone!! Rival Sencor Treflan	Reglone!! Treflan*	
	Afolan F Gramoxone®#	Eptam Gramoxone®#	Basifapon Eptam	Afolan F Eptam	Afolan F	Afolan F	Gramoxone®#	Afolan F	Afolan F (seedling)	Afolan F	Afolan F	Gramoxone®#	Eptam			

<b>LENTILS</b>	Sencor	Rival Treflan	Lexone Rival Sencor Treflan		Rival Treflan	Hoe-Grass 284 Rival Treflan	Hoe-Grass 284 Rival Treflan		Hoe-Grass 284 Rival Treflan	Sencor	Lexone Sencor	Rival Treflan			Lexone Rival Sencor Treflan	Lexone Sencor
<b>PEAS (Field and Processing)</b> • Check label to ensure chosen chemical or mix is registered for use on the crop.	MCPA* Amine & Salts Region!! Sencor	MCPA* Amine & Salts Region!! Rival Treflan	Basagran@ Lexone MCPA* Amine & Salts Phenoxylene Plus Region!! Rival Sencor Treflan	Basagran@ Lexone MCPA* Amine & Salts Phenoxylene Plus Region!! Rival Treflan	Region!! Rival Treflan	Basfapon@ Dalapon@ Hoe-Grass 284 Region!! Rival Treflan	Basfapon@ Dalapon@ Hoe-Grass 284 Region!! Rival Sodium TCA (field) Treflan	MCPA* Amine & Salts Region!!	Basfapon@ Dalapon@ Hoe-Grass 284 Region!! Rival Treflan	Lexone MCPA* Amine & Salts Region!! Sencor	Region!! Rival Treflan	Tropotox Plus	Phenoxylene Plus Region!!	Basagran@ Lexone MCPA* Amine & Salts Phenoxylene Plus Region!! Rival Sencor Treflan	Basagran@ Lexone MCPA* Amine & Salts Phenoxylene Plus Region!! Rival Sencor Treflan	
<b>POTATOES</b> WP (White Potatoes) TS (Table Stock Only)	Gramoxone# Region!! Sencor	Afolan F Gramoxone# Lorox L Region!! Sencor*	Afolan F Eptam Gramoxone# Lexone Lorox L Patoran Phenoxylene Plus (TS)# Region!! Sencor	Gramoxone# Phenoxylene Plus (TS)# Region!!	Gramoxone# Lorox L Region!!	Basfapon Fusilade Gramoxone# Hoe-Grass 284 Region!!	Afolan F Basfapon@ Dual Eptam Fusilade Gramoxone# Hoe-Grass 284 Lexone* Lorox L Patoran Region!! Sencor	Afolan F Gramoxone# Lorox L Region!!	Afolan F@ Basfapon@ Dual Eptam Fusilade Gramoxone# Hoe-Grass 284 Lorox L Patoran Region!! Sencor	Afolan F Gramoxone# Lorox L Region!! Sencor	Afolan F@ Gramoxone# Lorox L Region!! Sencor	Afolan F@ Gramoxone# Lorox L Region!! Sencor	Afolan F@ Gramoxone# Lexone* Lorox L Patoran Phenoxylene Plus (TS)# Region!! Sencor*	Afolan F Eptam Gramoxone# Lexone Lorox L Patoran Phenoxylene Plus (TS)# Region!! Sencor	Afolan F Gramoxone# Lexone Lorox L Patoran Phenoxylene Plus Region!! Sencor	
<b>RUTABAGAS</b>		Rival Treflan	Eptam Rival Treflan		Rival Treflan	Rival Treflan	Eptam Rival Treflan		Eptam Rival Treflan		Rival Treflan			Eptam Rival Treflan		Eptam Rival Treflan
<b>SOYBEANS</b>	Region!!	Region!! Rival Treflan	Basagran@ Patoran Region!! Rival Treflan	Basagran@ Region!!	Region!! Rival Treflan	Hoe-Grass 284 Poast Region!! Rival Treflan	Hoe-Grass 284 Patoran Poast Region!! Rival Treflan	Region!!	Hoe-Grass 284 Patoran Poast Region!! Rival Treflan	Region!!	Region!! Rival Treflan		Patoran Region!!	Basagran@ Patoran Region!! Rival Treflan	Basagran Patoran Region!!	
<b>SUNFLOWERS</b>	Region!!	Region!! Rival Treflan	Amiben & Treflan Eptam Region!! Rival Treflan	Region!!	Region!! Rival Treflan	Fusilade Hoe-Grass 284 Poast Region!! Rival Treflan	Amiben & Treflan Eptam Fusilade Hoe-Grass 284 Poast Region!! Rival Treflan	Region!!	Amiben & Treflan* Eptam Fusilade Hoe-Grass 284 Poast Region!! Rival Treflan	Region!!	Amiben & Treflan Region!! Rival Treflan		Region!! Rival Treflan	Amiben & Treflan Eptam Region!! Rival Treflan	Amiben & Treflan Region!!	
<b>TAME BUCKWHEAT</b>						Basfapon Hoe-Grass 284	Basfapon Hoe-Grass 284		Basfapon Hoe-Grass 284							
<b>TRITICALE</b>	Pardner Torch Torch DS	Pardner Torch Torch DS			Pardner Torch Torch DS	Hoe-Grass 284	Hoe-Grass 284		Hoe-Grass 284	Pardner Torch Torch DS			Pardner Torch Torch DS	Pardner Torch Torch DS	Pardner Torch Torch DS	Pardner Torch Torch DS

Lexone Rival Sencor Treflan	Lexone Sencor		Carbyne 2EC Hoe-Grass 284 Rival Treflan	Rival Treflan	Lexone Rival Sencor Treflan	Rival Treflan		Lexone Sencor	Lexone Sencor	Lexone Sencor	Lexone Sencor	Lexone Sencor	Rival Sencor Treflan	
Basagran® Lexone MCPA* Amine & Salts Phenoxylene Plus Reglone!! Rival Sencor Treflan Tropotox Tropotox Plus	Basagran® Lexone MCPA* Amine & Salts Phenoxylene Plus Reglone!! Sencor Tropotox Tropotox Plus	Basagran® Regione!!	Avadex BW Bastapon Carbyne Dalapon Hoe-Grass 284 Reglone!! Rival Treflan	MCPA* Amine & Salts** Reglone!! Rival Treflan	Basagran MCPA* Amine & Salts Phenoxylene Plus Reglone!! Rival Treflan Tropotox Tropotox Plus	Basagran® MCPA* Amine & Salts Phenoxylene Plus Reglone!! Rival Treflan Tropotox Tropotox Plus	Basagran® MCPA* Amine & Salts Phenoxylene Plus Reglone!! Rival Treflan Tropotox Tropotox Plus	Basagran® Lexone MCPA* Amine & Salts Phenoxylene Plus Reglone!! Sencor	Amitrol T (spot) Lexone MCPA* Amine & Salts Phenoxylene Plus (annual) Reglone!! Sencor Tropotox Tropotox Plus	Basagran Lexone Reglone!! Sencor	Basagran® Lexone MCPA* Amine & Salts Phenoxylene Plus Reglone!! Sencor Tropotox Tropotox Plus	Amitrol T (spot) Basagran® MCPA* Amine & Salts Phenoxylene Plus Reglone!! Sencor Tropotox Tropotox Plus	Basagran® Regione!! Rival Sencor Treflan	Reglone!! Treflan*
Afolan F Eptam Gramoxone®# Lexone® Lorox L Patoran Phenoxylene Plus (TS)®# Reglone!! Sencor	Afolan F Gramoxone®# Lexone® Lorox L Patoran Phenoxylene Plus (TS)®# Reglone!! Sencor	Eptam Gramoxone®# Regione!!	Bastapon Eptam Fusilade Gramoxone®# Lexone Lorox L Patoran Phenoxylene Plus (TS)®# Reglone!! Sencor	Afolan F Eptam Gramoxone®# Lexone Lorox L Patoran Phenoxylene Plus (TS)®# Reglone!! Sencor	Afolan F Eptam Gramoxone®# Lexone Lorox L Patoran Phenoxylene Plus (TS)®# Reglone!! Sencor	Afolan F Eptam Gramoxone®# Lexone Lorox L Patoran Phenoxylene Plus (TS)®# Reglone!! Sencor	Gramoxone®# Lexone Reglone!! Sencor	Afolan F Gramoxone®# Lexone Lorox L Patoran Phenoxylene Plus (TS)®# Reglone!! Sencor	Afolan F (seeding) Gramoxone®# Lorox L (A) Phenoxylene Plus (annual) Reglone!! Sencor	Afolan F Eptam Gramoxone®# Lexone Lorox L Patoran Phenoxylene Plus (TS)®# Reglone!! Sencor	Afolan F Gramoxone®# Lexone Lorox L Patoran Phenoxylene Plus (TS)®# Reglone!! Sencor	Gramoxone®# Lorox L* Reglone!!	Gramoxone®# Lexone® Reglone!! Sencor	Eptam Fusilade Gramoxone®# Lexone® Reglone!! Sencor*
Eptam Rival Treflan	Eptam	Eptam	Eptam Rival Treflan	Eptam Rival Treflan	Eptam Rival Treflan	Eptam Rival Treflan				Eptam			Rival Treflan	Eptam
Basagran® Patoran Reglone!! Rival Treflan	Basagran Patoran Reglone!!	Basagran® Reglone!!	Hoe-Grass 284 Poast Reglone!! Rival Treflan	Patoran Reglone!! Rival Treflan	Basagran® Patoran Reglone!! Rival Treflan	Basagran Patoran Reglone!! Rival Treflan	Basagran® Reglone!!	Basagran® Patoran Reglone!!	Amitrol T (spot) Reglone!!	Basagran® Patoran Reglone!!	Basagran® Patoran Reglone!!	Amitrol T (spot) Basagran® Reglone!!	Basagran Reglone!! Rival Treflan	Poast Reglone!! Treflan*
Amiben & Treflan Eptam Reglone!! Rival Treflan	Amiben & Treflan Reglone!!	Eptam Reglone!!	Amiben & Treflan Carbyne 2EC Eptam Fusilade Hoe-Grass 284 Poast Reglone!! Rival Treflan	Amiben & Treflan Eptam Reglone!! Rival Treflan	Amiben & Treflan Eptam Reglone!! Rival Treflan	Eptam Reglone!! Rival Treflan	Reglone!!	Reglone!!	Amiben & Treflan Reglone!!	Reglone!!	Eptam Reglone!!	Amiben & Treflan Reglone!!	Reglone!! Rival Treflan	Eptam Fusilade Reglone!! Treflan*
			Hoe-Grass 284											
Pardner Torch Torch DS	Pardner Torch Torch DS		Hoe-Grass 284 Mataven		Pardner Torch Torch DS			Pardner Torch Torch DS			Pardner Torch Torch DS		Pardner Torch Torch DS	

NOTE: Insecticides Listed By:  
Active ingredient  
(Trade Name)

# INSECTICIDE SELECTOR CHART

CROPS	INSECTS	BEETLES						BUTTERFLIES AND MOTHS						
		BLISTER BEETLES	COLORADO POTATO BEETLE	FLEA BEETLES	RED TURNIP BEETLE	WEEVILS (Sweet Clover, Alfalfa)	WIREWORMS	ALFALFA LOOPER	ARMYWORMS	*BERTHA ARMYWORM OR CLOVER CUTWORM	BEET WEBWORM	CUTWORMS (Army, Red-backed, Pale Western)	DIAMONDBACK MOTH LARVAE	EUC... *CO...
BARLEY						Gamma BHC (Lindane)		Carbaryl (Sevin) Malathion Methomyl (Lannate, Nudrin) Methoxychlor Trichlorfon (Dylox)			Chlorpyrifos (Lorsban) Permethrin (Ambush)			
OATS						Gamma BHC (Lindane)		Carbaryl (Sevin) Malathion Methomyl (Lannate, Nudrin) Methoxychlor Trichlorfon (Dylox)			Chlorpyrifos (Lorsban) Permethrin (Ambush)			
RYE						Gamma BHC (Lindane)		Carbaryl (Sevin) Malathion Trichlorfon (Dylox)			Chlorpyrifos (Lorsban) Permethrin (Ambush)			
WHEAT						Gamma BHC (Lindane)		Carbaryl (Sevin) Malathion Methomyl (Lannate, Nudrin) Methoxychlor Trichlorfon (Dylox)			Chlorpyrifos (Lorsban) Permethrin (Ambush)			
CORN (FIELD)						Gamma BHC (Lindane)		Carbaryl (Sevin) Methomyl (Lannate, Nudrin) Methoxychlor			Permethrin (Ambush)		Carbamates Carbofend Endosulfan Malathion *Corn	
ALFALFA	Carbaryl (Sevin)				Azinphos-methyl (Guthion) Carbaryl (Sevin) Carbofuran (Furadan) Dimethoate (Cygon) Malathion Methidathion (Supracide) Methoxychlor		Methoxychlor Trichlorfon (Dylox)		Carbaryl (Sevin) Trichlorfon (Dylox)					
CLOVER	Carbaryl (Sevin)				Azinphos-methyl (Guthion) Carbaryl (Sevin) Dimethoate (Cygon) Malathion Methoxychlor		Carbaryl (Sevin) Methoxychlor		Carbaryl (Sevin)					
PASTURE														
CANOLA		Azinphos-methyl (Guthion) Carbaryl (Sevin) Carbofuran (Furadan) Deltamethrin (Decis) Gamma BHC (Lindane) Malathion Methidathion (Supracide) Terbufos (Counter)	Azinphos-methyl (Guthion) Carbofuran (Furadan) Methidathion (Supracide)		Chlorpyrifos (Lorsban) Methomyl (Lannate, Nudrin)		Chlorpyrifos* (Lorsban*) Methamidophos* (Monitor*) Methomyl (Lannate, Nudrin) *Bertha Armyworm Only	Methomyl (Lannate, Nudrin) Trichlorfon (Dylox)	Chlorpyrifos (Lorsban) Permethrin (Ambush)	Chlorpyrifos (Lorsban) Permethrin (Ambush)	Azinphos-methyl (Guthion) Malathion Methidathion (Supracide) Trichlorfon (Dylox)			
FLAX							Trichlorfon (Dylox)	Methomyl (Lannate, Nudrin)	Trichlorfon (Dylox)	Chlorpyrifos (Lorsban) Permethrin (Ambush)			Chlorpyrifos (Lorsban)	Malathion Methidathion (Supracide)

LEPIDOPTERANS				FLIES		GRASSHOPPERS	PLANT BUGS	STORED GRAIN INSECTS	SUCKING INSECTS			THRIPS		
Sp.	DIAMONDBACK MOTH LARVAE	EUROPEAN CORN BORER OR CORN EARWORM	FLAX BOLLWORM	THISTLE BUTTERFLY (Painted Lady)	BEEF LEAFMINER	ROOT MAGGOTS (Corn, Sugar Beet)	(Clear-winged, migratory, two-striped)	ALFALFA, SUPERB, STINK, LYGUS, TARNISHED	FLOUR BEETLES, GRAIN BEETLES, MEDITERRANEAN FLOUR MOTH	APHIDS (Corn leaf, Green bug, Green Peach, English Grain, Pea)	LEAFHOPPERS (Potato)	SPITTLEBUGS	BARLEY, GRASS, RED CLOVER	
							Azinphos-methyl (Guthion) Carbaryl (Sevin) Carbofuran (Furadan) Chloryrifos (Lorsban) Deltamethrin (Decis) Dimethoate (Cygon) Malathion		Malathion Phosphine (Gastoxin, Phostoxin)	Dimethoate (Cygon) Malathion			Dimethoate (Cygon) Malathion Methomyl (Lannate, Nudrin)	
							Azinphos-methyl (Guthion) Carbaryl (Sevin) Carbofuran (Furadan) Chloryrifos (Lorsban) Dimethoate (Cygon) Malathion		Malathion Phosphine (Gastoxin, Phostoxin)	Dimethoate (Cygon) Malathion			Dimethoate (Cygon) Malathion Methomyl (Lannate, Nudrin)	
							Azinphos-methyl (Guthion) Carbaryl (Sevin) Malathion		Malathion Phosphine (Gastoxin, Phostoxin)	Dimethoate (Cygon) Malathion				
							Azinphos-methyl (Guthion) Carbaryl (Sevin) Carbofuran (Furadan) Chloryrifos (Lorsban) Deltamethrin (Decis) Dimethoate (Cygon) Malathion		Malathion Phosphine (Gastoxin, Phostoxin)	Dimethoate (Cygon) Malathion			Dimethoate (Cygon) Malathion Methomyl (Lannate, Nudrin)	
		Carbaryl (Sevin) Carbofuran (Furadan) Endosulfan* (Thiodan) Malathion* *Corn Earworm Only			Diazinon	Carbaryl (Sevin) Carbofuran (Furadan) Malathion		Malathion Phosphine (Gastoxin, Phostoxin)	Malathion Endosulfan (Thiodan)				Malathion	
							Azinphos-methyl Carbaryl (Sevin) Carbofuran (Furadan) Dimethoate (Cygon) Malathion Methoxychlor	Dimethoate (Cygon) Endosulfan (Thiodan) Malathion Methidathion (Supracide) Trichlorfon (Dylox) (usually necessary to control in seed fields)		Azinphos-methyl (Guthion) Dimethoate (Cygon) Malathion Methidathion (Supracide) Methoxychlor	Azinphos-methyl (Guthion) Carbaryl (Sevin) Dimethoate (Cygon) Malathion Methidathion (Supracide) Methoxychlor	Azinphos-methyl (Guthion) Carbaryl (Sevin) Dimethoate (Cygon) Malathion Methidathion (Supracide) Methoxychlor	Azinphos-methyl (Guthion) Endosulfan (Thiodan) Malathion	Azinphos-methyl (Guthion) Endosulfan (Thiodan) Malathion
							Azinphos-methyl (Guthion) Carbaryl (Sevin) Carbofuran (Furadan) Dimethoate (Cygon) Malathion Methoxychlor	Azinphos-methyl (Guthion) Dimethoate (Cygon) Malathion		Azinphos-methyl (Guthion) Dimethoate (Cygon) Malathion	Azinphos-methyl (Guthion) Carbaryl (Sevin) Dimethoate (Cygon) Malathion Methoxychlor	Azinphos-methyl (Guthion) Endosulfan (Thiodan) Malathion		
							Carbaryl (Sevin) Carbofuran (Furadan) Dimethoate (Cygon) Malathion	Dimethoate (Cygon)		Dimethoate (Cygon)	Dimethoate (Cygon)			
ban) sh)	Azinphos-methyl (Guthion) Malathion Methidathion (Supracide) Trichlorfon (Dylox)						Carbaryl (Sevin) Carbofuran (Furadan) Chloryrifos (Lorsban) Dimethoate (Cygon) Malathion Methamidophos (Monitor)			Dimethoate (Cygon)	Dimethoate (Cygon)			
ban) sh)			Methomyl (Lannate, Nudrin)				Carbofuran (Furadan) Malathion							
ban) sh)							Carbofuran (Furadan) Malathion							

<b>CANOLA</b>			Azinphos-methyl (Guthion) Carbaryl (Sevin) Carbofuran (Furadan) Deltamethrin (Decis) Gamma BHC (Lindane) Malathion Methidathion (Supracide) Terbufos (Counter)	Azinphos-methyl (Guthion) Carbofuran (Furadan) Methidathion (Supracide)										
<b>FLAX</b>								Trichlorfon (Dylox)	Methomyl (Lannate, Nudrin)	Trichlorfon (Dylox)	Chlorpyrifos (Lorsban) Permethrin (Ambush)			
<b>MUSTARD</b>			Carbofuran (Furadan) Deltamethrin (Decis) Gamma BHC (Lindane) Malathion Methidathion (Supracide)								Chlorpyrifos (Lorsban)	Malathion Methidathion (Supracide)		
<b>SUNFLOWER</b>												Chlorpyrifos (Lorsban)		
<b>SUGAR BEETS</b>			Azinphos-methyl (Guthion) Malathion	Carbofuran (Furadan) Methidathion (Supracide)			Gamma BHC (Lindane) Terbufos (Counter)				Trichlorfon (Dylox)	Chlorpyrifos (Lorsban) Permethrin (Ambush)		
<b>POTATO</b>	Methoxychlor	Aldicarb (Temik) Azinphos-methyl (Guthion) Carbaryl (Sevin) Carbofuran (Furadan) Chlorpyrifos (Lorsban) Deltamethrin (Decis) Endosulfan (Thiodan) Malathion Methamidophos (Monitor) Methidathion (Supracide) Permethrin (Ambush)	Aldicarb (Temik) Carbofuran (Furadan) Chlorpyrifos (Lorsban) Diazinon Endosulfan (Thiodan) Methamidophos (Monitor) Methidathion (Supracide) Methomyl (Lannate, Nudrin) Permethrin (Ambush)			Fonofos (Dyfonate) *not included in manual						Chlorpyrifos (Lorsban)		
<b>SWEET CORN</b>							Gamma BHC (Lindane,	Carbaryl (Sevin) Methoxychlor Trichlorfon (Dylox)				Chlorpyrifos (Lorsban)		Carbaryl Carbofuran Endosulfan Methomyl Nudrin Permethrin *Corn Ea

Chlorpyrifos (Lorsban) Permethrin (Ambush)	Azinphos-methyl (Guthion) Malathion Methidathion (Supracide) Trichlorfon (Dylox)						Carbaryl (Sevin) Carbofuran (Furadan) Chlorpyrifos (Lorsban) Dimethoate (Cygon) Malathion Methamidophos (Monitor)			Dimethoate (Cygon)	Dimethoate (Cygon)		
Chlorpyrifos (Lorsban) Permethrin (Ambush)			Methomyl (Lannate, Nudrin)				Carbofuran (Furadan) Malathion						
Chlorpyrifos (Lorsban)	Malathion Methidathion (Supracide)						Carbofuran (Furadan) Malathion						
Chlorpyrifos (Lorsban)				Methidathion (Supracide)									
Chlorpyrifos (Lorsban) Permethrin (Ambush)					Trichlorfon (Dylox)	Aldicarb (Temik) Carbofuran (Furadan) Terbufos (Counter)				Endosulfan (Thiodan)			
Chlorpyrifos (Lorsban)							Dimethoate (Cygon)	Carbofuran (Furadan) Chlorpyrifos (Lorsban) Endosulfan (Thiodan) Methidathion (Supracide) Permethrin (Ambush)		Aldicarb (Temik) Carbofuran (Furadan) Diazinon Dimethoate (Cygon) Endosulfan (Thiodan) Malathion Methamidophos (Monitor) Methomyl (Lannate, Nudrin)	Aldicarb (Temik) Carbofuran (Furadan) Diazinon Dimethoate (Cygon) Endosulfan (Thiodan) Malathion Methamidophos (Monitor) Methidathion (Supracide) Methomyl (Lannate, Nudrin) Methoxychlor Permethrin (Ambush)		
Chlorpyrifos (Lorsban)		Carbaryl (Sevin) Carbofuran (Furadan) Endosulfan* (Thiodan) Methomyl (Lannate, Nudrin) Permethrin (Ambush) *Corn Earworm Only			Diazinon	Carbaryl (Sevin) Carbofuran (Furadan) Malathion			Endosulfan (Thiodan) Malathion			Malathion	





